University of Washington

ARBORETUM BULLETIN

Published by the Arboretum Foundation

VOL. 40, NO. 4, 1977

Concerning this issue...

With the last issue of Volume 40 we bring to you a Christmas present. The examples of botanical drawing reproduced on these pages are representative of a fine collection of rare books on botanical subjects in the keeping of the Suzzallo Library at the University of Washington. Those which belong to the Arboretum will eventually be housed in the library of its new headquarters. In the meantime, R.D. Monroe, Head of Special Collections at the Suzzallo Library, invites anyone who is interested to visit his department and enjoy the treasures there.

As winter approaches all of us wonder what surprises the weather has in store for us. T.J. Blasing takes an overall look at possible future trends and at present means of predicting climatic patterns. For gardeners the subject is of special concern in relation to plants of borderline hardiness. A.R Kruckeberg offers a rationale for trying such exotics even if they live for only a few seasons.

During the last year and a half the editors of the *Bulletin* have slowly changed its format. We feel that at this point we can define some of our intentions for you. In every issue, the article with the most interesting illustrations will wrap itself around the centerspread. Announcements of most types will appear at the back of the magazine after the book reviews, insofar as the necessities of layout permit; if possible, the Calendar of Events will be the last item before the advertisements. Inside the front cover, we have revised the masthead to include the staff of the Arboretum. We believe that important messages from the President of the Arboretum Foundation should be included within the main body of the publication where they are more likely to be read. The inside front cover will be reserved for more casual comments.

We have worked out a rather uneven publication schedule. To avoid the Christmas rush of mail, we feel it is desirable to have your last issue of the year ready by late November, but we are withholding publication of the spring issue until at least mid-March, hoping thereby to maintain a closer connection with spring activities in the Arboretum. *THE EDITOR*

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The ARBORETUM BULLETIN is published quarterly, as a bonus of membership, by the University of Washington Arboretum Foundation, a non-profit organization to further the development of the University of Washington Arboretum. Information regarding membership in the Foundation may be obtained by writing to the Arboretum Foundation, University of Washington, Seattle, Wa. 98195 or by calling 206-325-4510. Annual subscriptions are available to educational institutions for $5.00. Articles on botany and horticulturally-related subjects written by professional and amateur botanists, horticulturists, educators and gardeners are welcomed. No part of the BULLETIN may be reprinted without the authority of the Arboretum Foundation. Lithography by Frayn Printing Company.

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ARBORETUM BULLETIN

VOLUME 40, NUMBER 4, 1977

TABLE OF CONTENTS

Our Changing Climate ..... T.J. Blasing 2

Gardening With Borderline Plants ..... A.R. Kruckeberg 7

Juki Iida ..... Kenneth W. Sorrells 13

Nature is Revealed, Art Concealed ..... Robert D. Monroe 14

Leaves from a Collector's Notebook ..... Brian O. Mulligan 24

Bribes, Decoys and Ant Guards ..... B.J.D. Meeuse 26

Book Reviews 31

Garden Vignettes 33

Pablo Retires — Again 34

Announcements from the Unit Council 35

Notes and Comments 35

Classes 36

Calendar of Events 36

COVER
Pseudotsuga menziesii, from Volume 3
of Lambert's *Description of the Genus Pinus,*
see article beginning on page 14.
The plate is labeled *Pinus Douglassi,*
as the species was known at that time.

Our Changing Climate

*T.J. BLASING**

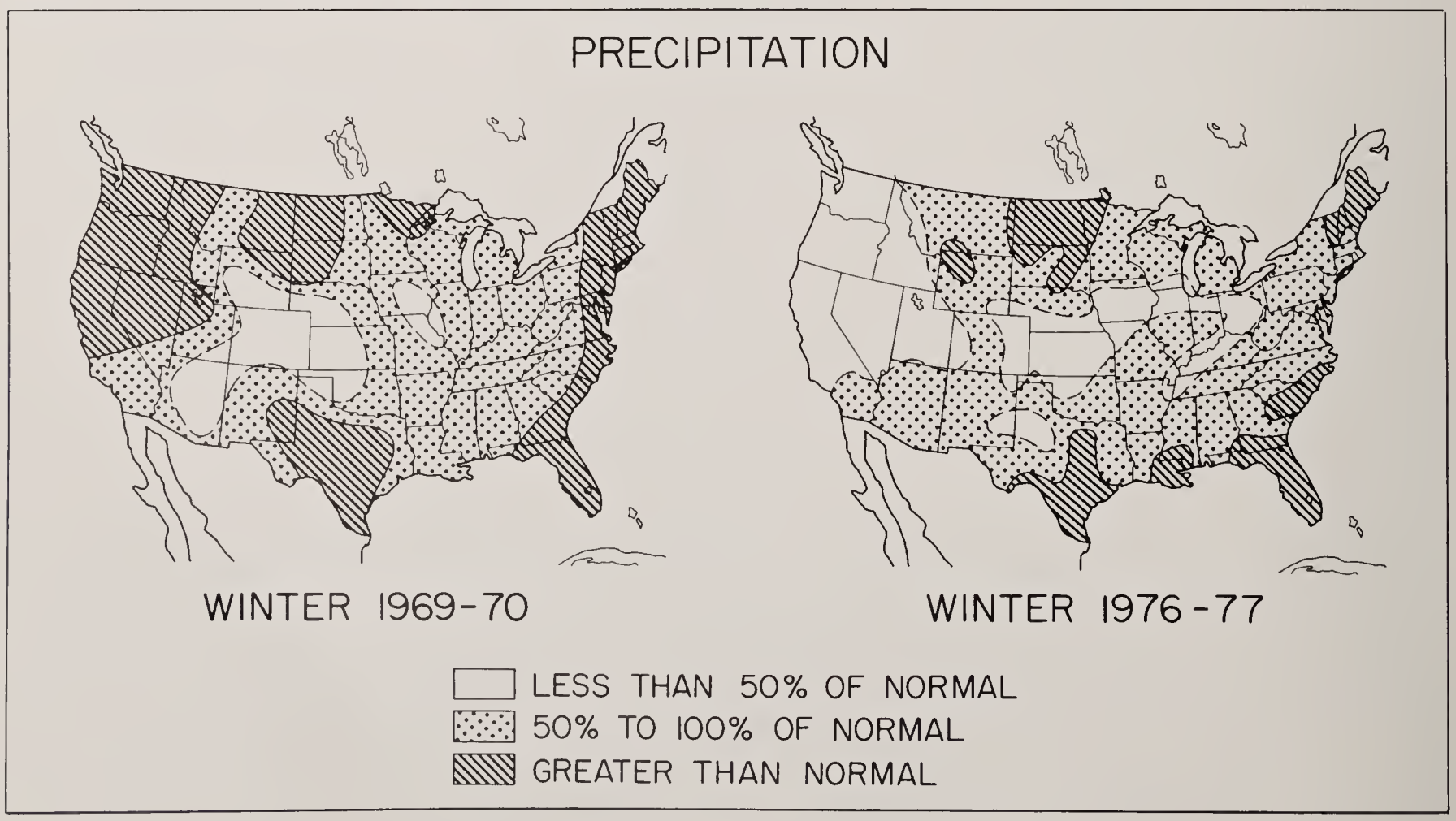
Last winter hit us with a double whammy. The bitter cold in the east and drought over much of the country had appreciable effects on the economy as well as on water conservation practices in many areas. Other effects of last winter include an increased awareness of climatic variability and more interest in finding out about the predictability of climate.

In order to forecast climate with any accuracy we must first understand how the atmosphere works on longtime scales. Climatic data including temperature, precipitation and pressure have been recorded at many locations for over 100 years. A wide network of upper air measurements for over 30 years and satellite data for more than 10 years are also now available. We now have high-speed computers to help analyze this data for such purposes as identification and study of winters similar to the last one, and investigation of conditions of previous autumns which might have caused such winters. It is now possible to study almost a century-long record of temperature trends for large portions of the earth's surface in order to check for possible responses to changes in solar activity or to human industrial influences such as the increasing amounts of atmospheric carbon dioxide or anthropogenic pollution.

*T.J. Blasing received his Ph.D. from the University of Wisconsin, School of Climatic Research. He was partly trained at the Laboratory for Tree-Ring Research, University of Arizona in Tucson, which has been so widely quoted by the press during this year of unusual weather. He has worked there for a number of years designing methods for reconstructing past climates.

Footnotes referred to in this article supply specific climatic data for years mentioned by the author. Since they are not part of the original text, they have been placed at the end before the references.

Fig. 1. Precipitation compared in the winters of 1969-70 and 1976-77.



However in order to assess the possibility of human effects on climate, and to investigate climatic variations over time periods longer than a century, we must be able to supplement the modern climatic record (which covers only the period of greatest industrial activity) with information about the climate of pre-industrial times. This is done by obtaining climatic information from indirect sources such as annual ring widths of trees which are hundreds of years old (see "Trees — The Silent Historians" by Linda Brubaker, *Arboretum Bulletin,* Vol. 39, no. 3, 1976).

Using the available information we can begin to study recent climatic behavior, such as that of last winter, in the context of historical perspective with the hope that studies of past climatic variation may teach us something about how to predict future climatic behavior.

Winters similar to the last one have occurred before, but usually (as in 1969-70[1]) they are accompanied by ample precipitation in the Pacific Northwest. Precipitation in the United States last winter and during the winter of 1969-70 are compared in Figure 1. Over most of the country the patterns are similar, but in the Pacific Northwest they are opposite. The patterns of atmospheric pressure for the two winters (Fig. 2) were also quite similar except that the areas of positive and negative departure from normal are centered a bit further west on last winter's map so that above normal pressures occurred in the west coast vicinity. As these features were displaced westward so was the region where the atmospheric circulation could produce abundant precipitation, leaving the northwest dry. Thus, slight variations in the general circulation of the atmosphere can mean the difference between ample precipitation and a droughty winter in the Pacific Northwest. More effort is needed to investigate the causes of this kind of climatic fluctuation which can produce severe hardship for large numbers of people.

Winters with pressure configurations similar to those shown in Fig. 2 usually bring cold weather to the East, warm weather to the West, and dry conditions to most of the interior of the country east of the continental divide. Such winters were relatively rare from 1900 to 1930, but have occurred more frequently since then. We have no way of predicting how often this type, or any other type, of winter will occur in the future, but we can look into the past and pull out some possibilities. Tree-ring evidence indicates that winters like the last one occurred slightly more often in the 17th, 18th and 19th centuries than they have so far in the 20th. Thus an increase in the frequency of that type of winter is a definite possibility.

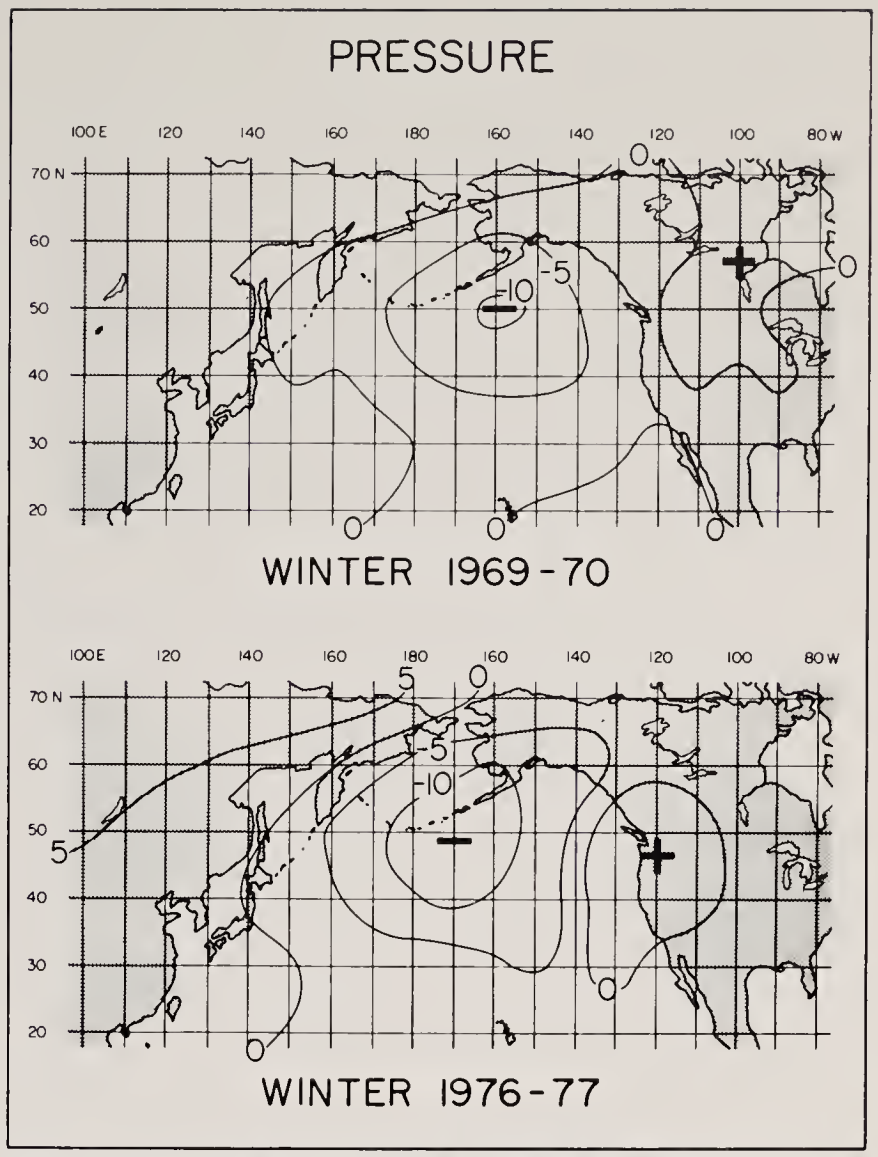


Fig. 2. Atmospheric pressure patterns compared in the winters of 1969-70 and 1976-77.
0 = normal
+ = higher than normal leading to dry conditions
− = lower than normal leading to moist conditions

It also appears from the tree-ring evidence that another winter climatic pattern, involving colder than normal winters in the northern United States but mild weather in the southern and central Rocky Mountain region, occurred much more frequently between 1600 and 1900 than it has since 1900. The winter of 1955-56[2] was a good example of that type of winter. Such winters were apparently much more frequent in the 1850's and 1860's according to both the tree-ring evidence and also to the data from frontier forts as analyzed by Wahl and Lawson (1970). More frequent occurrence of that type of winter is also a possibility for the future.

Another winter circulation type, which occurred in the winter of 1936-37 and again in the winter of 1948-49[3], produces very cold winters in the western United States which adversely affect winter wheat yields in the Palouse wheat belt

of eastern Washington as well as the California citrus crop. This type of winter climate occurred much more frequently in the twentieth century than it apparently did in the preceding 300 years, so if the climate returns to its long-term normal, this type of winter should become less frequent in the future.

These examples demonstrate that if the climate should revert to conditions of the past, there would be good effects as well as bad effects. The story is not all one-sided.

World Temperature Trends

Changes in the frequencies of certain seasonal climatic types, such as those mentioned above, are probably related to global-scale climatic variations. One way to study such variations is to try to monitor the earth's temperature and to see how it changes through time. There has been much discussion in the scientific literature about long-term trends in the average surface temperature of the earth. This has led to even more discussion on possible causes of the trends.

Before discussing such trends it is worthwhile to review what is being looked at and how clearly it can be perceived. Conventionally, what is looked at is the mean surface temperature of places where temperature is measured regularly, and this means primarily the populated areas on Northern Hemisphere continents. Perception of natural temperature trends in such areas is limited to some extent because of localized warming due to urban growth rather than to any significant natural or large-scale climatic change. Nevertheless, recent temperature trends as summarized in the literature are probably valid indicators of worldwide climatic changes. Figure 3 shows the Northern Hemisphere temperature trends as computed by Willett in 1950 and since updated by others.

There are many factors which may cause the earth's surface temperature to change. Three of the most widely discussed are: variations in the sun's energy output, increases in carbon dioxide and changes in the amount of particulate matter in the atmosphere.

If the sun's energy output were to decrease by two percent, another ice age could occur (Sellers, 1969). Unfortunately, the sun's energy output is not usually measured with enough precision to detect that kind of variation, but measurements from satellites may help. The problem with ground-based instruments is that the atmosphere is between the instrument and the sun. It's like trying to measure light through a dirty window which is jiggling.

It has been estimated that the amount of carbon dioxide in the atmosphere has increased about 10 percent since the turn of the century because of the burning of fossil fuels (see SMIC, 1971, p. 237). This greater carbon dioxide content increases the atmosphere's ability to retain heat, and this should make the earth become warmer. However, from about 1940 to 1970 it looked as if it were becoming cooler, at least in the Northern Hemisphere (Reitan, 1974). This cooling was attributed by some scientists to increases in the amount of particulate matter in the atmosphere because of some combination of volcanic activity and human activity. (Not all scientists are convinced this is the right explanation, but a better one has yet to be proposed.)

As mentioned earlier, measurements of the earth's temperature are taken primarily from the Northern Hemisphere. The Southern Hemisphere has not received enough attention. However, recent work by Damon and Kunen (1976) indicates that from the mid-1940's to about 1970, while the Northern Hemisphere was cooling, the Southern Hemisphere was not. Actually, higher latitudes of the Southern Hemisphere appear to have been warming since the early 1960's. The warming may be attributed to increased carbon dioxide in the Southern Hemisphere. Of course, carbon dioxide was also increasing in the Northern Hemisphere, but its warming effect may have been overcome, at least temporarily, by cooling effects of particulate matter in the atmosphere. The idea here is that particulate matter is primarily a product of the Northern Hemisphere and much of it may fall out of the atmosphere before crossing the equator (see Damon and Kunen, 1976, for more details).

A couple of years ago Broeker (1975) predicted that the cooling trend in the Northern Hemisphere would soon be overcome by the warming effect of increased carbon dioxide. Whether or not his explanation was correct, recent evidence presented by Brinkmann (1976) indicates that since 1970 the Northern Hemisphere has been warming up, particularly in high latitudes. However, the relatively short warming trend identified by Brinkmann may only be a temporary "blip" in an overall downward trend, like the one that oc-

curred in the early 1960's. We will have to wait at least a few years to find out.

Regardless of what the trend does, however, the associated weather patterns will be likely to lead to below normal temperatures in some regions and above normal temperatures in others. Our recent winter, for example, was cold in the East but warm in the West. From 1940 to 1970, while the eastern United States was cooling along with the Northern Hemisphere trend, much of the western United States was warming.

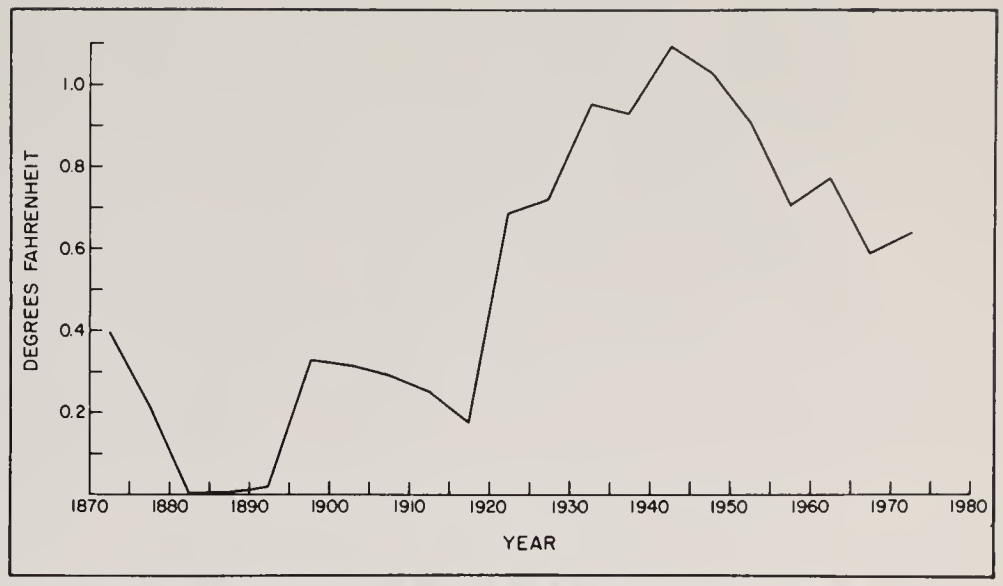


Fig. 3. Fluctuation in number of degrees F from 1870 to the present.

Towards Climatic Prediction

Even though the world temperature trend may tell you nothing about the weather features in the state of Washington, there almost certainly is a relationship between the trend and the frequencies of certain types of weather. The trends, in turn, may possibly be predictable from solar energy output or from the amount of carbon dioxide or particulate matter in the atmosphere. Using that chain of relationships it may be possible to predict future climate and to cast the prediction in terms of generalized weather so as to be more meaningful to planners.

The relationships involved, however, are far from clear and may be too weak or complicated to use for prediction. Further research is needed along this line to determine whether such a prediction scheme is even possible. Until the physical processes involved are well enough understood to use for climatic prediction, the best we can do is make probability statements based on past information. The more past information we have, the more accurate such probability statements are likely to be. Studies of past climatic information would also be useful in evaluating hypotheses about the physical causes of climatic change. One example of such a hypothesis is that the sunspot cycle indicates changes in the sun's energy output and is thereby related to climatic change. Another hypothesis is that big volcanic eruptions such as Tambora in 1815, or Krakatoa in 1883, may have injected enough particulate matter into the atmosphere to influence the climate.

Thus, much current climatic research is being done along two lines. One line involves investigating possible physical causes of climatic change such as variations in the amount of dust in the atmosphere, variations in the sun's energy output and increases in carbon dioxide. Reliable and accurate climatic forecasts can only come when we understand the physical causes of climatic change. While we are waiting for such knowledge, which by the most optimistic estimates will be several years in coming, a second line of research is open involving studies of past climate. Such studies can indicate which of several proposed physical mechanisms might or might not have been important over long time periods. These studies also allow us to assess climatic conditions that have occurred in the past and are therefore realistic possibilities to consider for the future.

Current Status

Could last winter's conditions have been predicted? A study by Namias (1977) comparing several independent seasonal forecasts shows surprising accuracy of prediction. Namias concluded, "The point I would like to stress is that, *at times,* premonitory 'signals' may be sufficiently loud that moderately successful forecasts can be made by different individuals using objective methods as a base." Namias also noted that factors included in these forecasts were "atmospheric behavior in antecedent months along with the month-to-month behavior of sea-surface temperature patterns over the North Pacific."

In seasonal forecasting it does not seem possible to predict on exactly which day a storm will be at a certain place, but it does seem possible in some cases to forecast general tendencies one season in advance with enough accuracy to be useful to the public sector. From all indications, we are a lot further on the road to seasonal forecasting than we were several years ago.

However on time scales longer than one

season in advance (e.g., relating to the development of another ice age) objective forecasting gives way to theory. Thus any "forecasting" of global warming or cooling over the next several decades or longer is really a statement of what may happen rather than what will occur. On such time scales it is probably more appropriate to be as specific as possible about what may happen, so that we can be best prepared for such future climatic possibilities.

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[1]These figures were recorded at the University of Washington campus, Seattle.

	PRECIPITATION		MIN. TEMP. (°F)		NO. OF DAYS BELOW 32°F	
	69-70	76-77	69-70	76-77	69-70	76-77
Nov.	2.68″	0.52″	32°	29°	1	4
Dec.	8.12″	2.04″	28°	32°	1	1
Jan.	7.80″	2.13″	24°	25°	8	18
Feb.	1.96″	1.88″	33°	32°	0	2
Mar.	3.45″	4.35″	31°	34°	5	0
Apr.	3.36″	1.18″	36°	37°	0	0

[2]The following figures were recorded at the University of Washington campus, Seattle.

1955-56	PRECIPITATION	MIN. TEMP. (°F)	NO. OF DAYS BELOW 32°F
Nov.	7.76″	10°	8
Dec.	7.89″	25°	11
Jan.	7.94″	18°	8
Feb.	2.51″	15°	16
Mar.	5.02″	25°	11
Apr.	0.80″	31°	1

[3]The following figures were recorded in Spokane.

1948-49	PRECIPITATION	AVERAGE TEMP. (°F)
Nov.	2.38″	34.8°
Dec.	3.13″	21.5°
Jan.	0.50″	8.5°
Feb.	3.08″	26.4°
Mar.	2.17″	38.0°
Apr.	0.42″	49.2°

Note: the temperatures listed above are average rather than minimum temperatures as shown in previous footnotes.

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From Joe Witt, a follow-up comment on weather in the Arboretum this year:

The drought of 1977 will be long remembered. There was a time in late July and early August when the watering crew was able to just barely keep up. Some 35 days passed with no measurable rainfall and an extended heat wave in mid-August placed a severe water stress on many plants. The broad-leaved evergreens were especially hardpressed and numerous rhododendrons have badly sunburned leaves. The drought ended, at least temporarily, August 21 with a mild rain that was followed by several periods of heavy precipitation including a "gully washer" during the night of August 25 which dumped over two inches of rain on the Arboretum in the matter of a few hours.

Fremontodendron californicum ssp. *napense* (p. 10). Brilliant yellow flowers and gray-green foliage. Photo: Brian O. Mulligan

Gardening With Borderline Plants

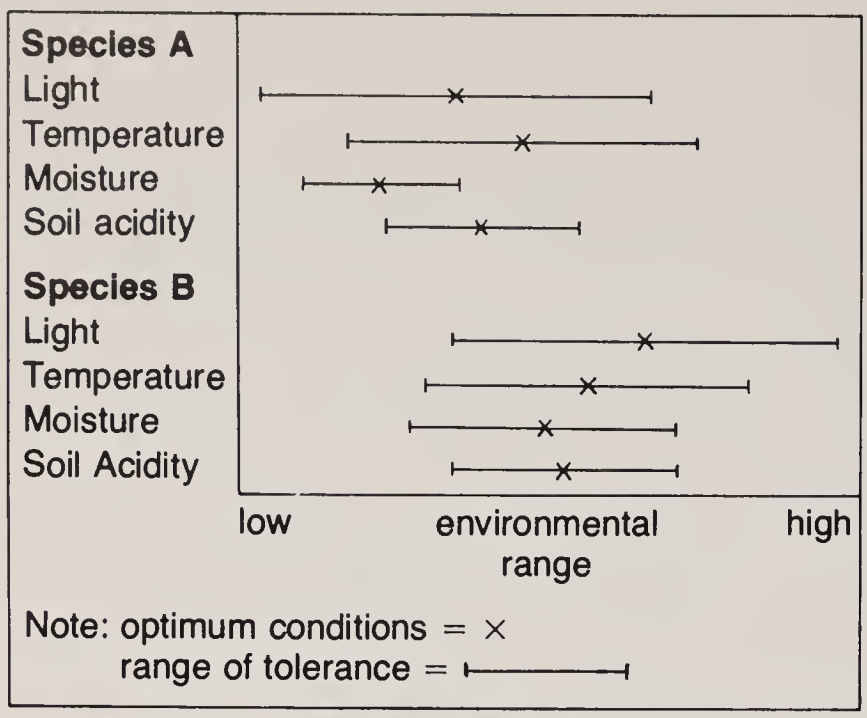
*A. R. KRUCKEBERG**

A conservative gardener may well ignore an article on plants at the borderline of environmental tolerance. "Too risky," says conventional wisdom. Often a choice specimen of borderline hardiness that made it through a mild winter gets ambushed by a more typical or unusually cold weather spell. Yet there are many choice plants of presumed borderline tolerance to one's local conditions that invite the gardener's ingenuity to make them succeed; most experienced gardeners respect the inborn tolerance ranges of the plants they grow. In every plantsman's heart there persists some spark of the gambler's instinct: Why not take a chance? So some of us will continue to try plants that are, for one reason or other, not wholly suited to our region. It is to those intrepid souls that this article is addressed. Indeed, borderline plants can be grown with special care and exceptionally favorable local conditions — but with the hazard of failure.

All plants have upper and lower limits to their tolerance of the many environmental influences that impinge on them. This fundamental truism of geographic botany is both trite and profound. Trite in that most gardeners just know that any plant whose place of origin is milder in climate or drier in rainfall may not survive in coastal Pacific Northwest. A bit more profound, though, is the body of theory, data and practice behind the tolerance idea. The theory, simply stated, goes like this. Each species (or geographic race of a species) has a set of tolerance ranges for its vital functions. Reactions to light, temperature, water stress, soil acidity, soil nutrients, competition with other plant species, pests and pathogens, or pollution susceptibility are the principal factors to which a plant is sensitive. The response of a plant, then, is the net expression of the tolerance for each factor. Should tolerance to one factor be more restrictive than all the others, then this one factor will limit plant survival. Some species have broad tolerance ranges; others narrow limits. A visual representation of this basic law of tolerance can be helpful. (See p. 8.)

Note that Species A and B have largely overlapping tolerance ranges. They should therefore be able to coexist somewhere on the planet. In fact, a natural plant community (or a garden!) can be expressed as an association of plants whose tolerance ranges overlap. The concept of tolerance spans will be used throughout this dis-

*Dr. Kruckeberg needs no introduction to readers of the *Bulletin*. He is that rare species, a botanist who loves to garden, and he pursues this hobby daringly and inventively in the garden that he and his wife, Mareen, share in Richmond Beach. Mrs. Kruckeberg also operates the MsK Nursery, from which many of the plants he recommends may be obtained.



Comparison of tolerance ranges of two hypothetical species.

cussion and indeed should become a part of the thinking of all serious gardeners.

Plants of borderline status can be easily fitted into the concept of tolerance ranges. Any species when placed in an environment where the extremes of its tolerances are tested can be subjected to borderline conditions. Most commonly, it is climate (regional and local) that tests a plant's survivability. But we should keep in mind that other environmental factors such as those mentioned in the second paragraph may decide borderline survival.

The most critical climatic factors for plant growth are temperature, light and moisture, and these are often inextricably related. Of the three, temperature is the most critical in a garden, since it is less under our control than light or moisture. The low end of the range of temperature tolerance determines the hardiness rating of a plant. Cold hardiness, simply stated, is the inherited (and to a lesser extent, acquired) capacity of a plant to withstand a certain level of low temperature. Hardiness zones for the United States, coupled with hardiness ratings for ornamentals, provide a good first approximation to the low temperature compatibility between plant and environment. Thus the Puget Sound basin is mostly rated as Zone VIII; plants rated as hardy in Zone VIII or lower numbered, colder zones are then said to be compatible with our temperature minima. It is the host of plants that are classed in the milder Zone IX that tempt trial.

Yet Zone VIII is really quite benign and can accommodate all plants from the most cold-hardy in Zone I to many that grow in the mildest parts of Great Britain. With all this horticultural wealth to draw upon, why be tempted by the chancy ones of doubtful hardiness? One enticement comes from a kind of one-up-manship amongst gardeners — a yen to show off a fine specimen of *Crinodendron* or *Lapageria* that one's friendly rival does not grow. A second inducement is the great wealth of plant material that lies at the border of our average hardiness limits: plants from California, evergreen oaks from the Southwest, the host of choice things from New Zealand and Australia, ornamentals from temperate South America, and many of the great introductions of Forrest, Wilson and Kingdon-Ward and other explorers of the China-Burma-upper India country that are not quite dependable in the Pacific Northwest.

A third reason for a bold approach is that the hardiness ratings are either average expectations or merely untested guesses. And, the western lowland of the Pacific Northwest is not a homogeneous region with respect to temperature. Areas near water, especially the Puget Sound, the Straits of Juan de Fuca, the ocean or even good-sized lakes act as buffers to lessen the reach of winter temperatures. Moreover, a garden situated on a slope benefits from cold air drainage, while the neighbor downslope may be in a frost pocket where the cold air lingers. On a smaller scale, the orientation of a planting — and its background — may spell the difference between success and failure for borderline species. A south- or west-facing slope gains degrees of temperature of warmth for the daring gardener. The shelter and radiant heat from walls, sides of buildings, etc. also works to the advantage of the borderline gambler.

A patient weather watcher will recognize another hardiness variable. No two winters seem to be alike. We may have a succession of mild ones, and the borderline plants survive to grow on with innocent vigor in the spring. Then comes a winter with a clout — cold snaps down to 10-15°F, like the memorable 1955 freeze, and then the borderliners are killed. Short of moving plants indoors, there is little protection one can give borderline plants when a good freeze comes along. But if your garden is a dynamic creation where its creator regularly renews the plantings, then the occasional loss of a borderline specimen offers the chance to try again. The chancy ones can last several years before the next *coup de grâce.* The best insurance against the

periodic loss is to have propagated in cold frame or greenhouse a few progeny of the semi-tender ones.

Once hooked on growing plants of borderline hardiness, the gardener will devise a variety of subterfuges to protect his plants from cold. Besides relying on the proper terrain and the attendant favorable microclimate, there are other kinds of cold insurance. Mulching with straw, dead bracken or pine needles will protect the root crown of a tender perennial. A chickenwire cylinder packed with the above materials can buffer a shrub or small tree against the cold. For a large tree, burlap matting wrapped around the trunk can offer some protection. But large specimens of borderline plants have already proved themselves able to take the average cold. It is only the infrequent "knock-out" cold spell that does the specimen in. So, even the more sanguine of garden gamblers intersperse tested hardy plants among the long-shot borderlines. It would not do to have *all* semi-tender species in one garden!

Limits of environmental tolerance are fixed in the heredities of organisms. Adaptation to a particular regime of climate, soil, etc., is the culmination of finely tuned adjustment to local conditions through ages of evolutionary processes. For those plant species whose geographic distributions cover extensive regions, the hereditarily fixed tolerance spans can differ markedly throughout the range of a single species. Just as the forester gathers seed for reforestation from the geographic race most compatible with the site, so should the gardener seek introductions from environmentally compatible localities. For forestry, agriculture and horticulture, this is the time-honored method of *provenance selection*. This means that seed or other propagating material of exotic plants should come from those parts of the native range or distribution that most closely approximate our conditions. For instance, many choice California natives range from southern California to southwestern Oregon. For introductions to our climate, we select strains from the northern part of the range. Seed of *Fremontodendron californicum* (flannel bush) or *Cercis occidentalis* (western redbud) from Shasta County plants in northern California fares much better with us than do introductions from farther south. And, *Umbellularia californica* (bay laurel), *Calocedrus decurrens* (incense cedar), *Quercus chrysolepis* (canyon live oak) and *Lithocarpus densiflorus* (tan oak) from southern Oregon overcome the borderline problem in the Northwest much better than sources farther to the south. Of course, this selection of hardier strains only works if the desired species has a wide distribution in latitude, some portion of which overlaps in tolerances our local conditions. Torrey pine *(Pinus torreyana)* is just too limited in distribution (coastal San Diego County) to have any northern, more hardy races.

A poorly understood phenomenon is the increase in hardiness as a specimen ages. Monterey pine *(Pinus radiata)* is rather tender when young, but is able to withstand moderately hard winters when it matures. We lost several young plants a few years ago in our garden north of Seattle, but now have three fine 60-foot tall trees that were in a more sheltered spot during their early years. Such experience suggests the need for protection of young plants; the same individuals can be left on their own later as they mature.

It is painfully difficult to pare down to a moderately short list all those choice borderline woody plants that one might chance in the garden. The

The weeping branches of *Picea smithiana* (p. 12). Photo: Nancy Walz

number of candidates is much larger than one would expect. From the three volumes of the newly revised Bean's *Trees and Shrubs Hardy in the British Isles,* or Hillier's *Manual of Trees and Shrubs,* as well as from McMinn's *Illustrated Manual of California Shrubs,* the gardener can develop long lists of plants that thrive in the San Francisco Bay area, in Cornwall or the west coast of Scotland and Ireland. The following lists are reluctant abridgements of a phytomaniac's desires.

Some Borderline Plants for Northwest Gardens*

CALIFORNIA TREES

*Abies bracteata** (Santa Lucia fir). Shelter and partial sun when young.

*Aesculus californica** (California buckeye). For milder coastal regions; thrives at Ballard Locks, Seattle.

*Pinus monophylla** (Pinyon pine). Full sun, sharp drainage; avoid frost pockets.

*P. muricata** (Bishop pine). Protection from cold north winds.

P. radiata† (Monterey pine). Protection when young.

P. torreyana[3] (Torrey pine). Said to grow here but not seen; only mildest sites.

*Platanus racemosa** (California sycamore). Worthy of trial with shelter.

Quercus agrifolia† (California live oak). May lose its leaves in hard winter; protect when young.

*Q. chrysolepis** (Canyon live oak). Northern races fairly hardy.

*Q. wislizenii** (Interior live oak). Same as *Q. agrifolia.*

Torreya californica (California nutmeg). Use northern California strains.

*Umbellularia californica** (California bay laurel). Northern strains fairly hardy.

CALIFORNIA SHRUBS

Adenostoma fasciculatum (Chamise). Northern strains; hot, dry sites.

Arctostaphylos. Many fine species of manzanita need further testing. All California species should prefer sheltered, sunny site. Try *A. andersonii*, A. densiflora*, A. glandulosa*, A. myrtifolia*[1] (Ione manzanita), *A. nummularia** (Pine barrens manzanita), *A. pumila* and *A. stanfordiana* ssp. *bakeri*.

*Carpenteria californica**. Beautiful evergreen from Sierra Nevada foothills; large mock-orange flowers; shelter and partial shade.

Ceanothus (California wild lilacs). Besides the few known hardy ones *(gloriosus*, impressus*, thyrsiflorus*†, *velutinus*),* others, especially from the Bay area north, should be tried: *C. cordulatus*[2], *C. incanus*, C. integerrimus** (southern Washington is its northern limit), *C. papillosus* and its var. *roweanus, C. purpureus, C. prostratus*[2] and its close relative *C. pumilus**. All will require hot, dry, yet sheltered sites in the Pacific Northwest. Has anyone tried the San Diegan beauty, *C. cyaneus*[1], against a warm wall?

*Cercis occidentalis** (Western redbud). Use northern strains.

*Cercocarpus betuloides** (Mountain mahogany). Use northern strains.

Chamaebatiaria millefolium. Small white bramble flowers on elegantly dissected foliage; needs sun.

Dendromecon rigida† (Bush poppy). Yellow poppies and glaucous leaves; warm, sunny wall.

Dirca occidentalis (Western leatherwood). Deciduous, daphne-flowered shrub of Bay area; partial shade and protection.

Fallugia paradoxa† (Apache plume). Striking desert shrub with white flowers and crimson, plumed seeds; warm wall.

Fremontodendron (California slippery-elm or flannel bush). Elegant foliage and yellow flowers; sun and shelter. *F. californicum* subsp. *napense*[2] and northern California forms of *F. californicum*[4] itself are borderline or better.

Garrya (Silk-tassel bush). Besides the hardy *G. elliptica** and *G. fremontii*, try *G. buxifolia* or *G. congdonii.*

Heteromeles arbutifolia[1] (Toyon or Christmas berry). Try northern strains.

Lavatera assurgentiflora[1] (Tree mallow). Try protected coastal areas.

Lyonothamnus floribundus (Catalina ironwood). Channel islands of California; sun, against wall.

Pickeringia montana (Chaparral pea). Dry, well-drained site; northern strains.

Prunus ilicifolia[1] (Holly-leaf cherry). Sun and shelter.

Quercus durata and *Q. dumosa** (Scrub oak). Northern strains do well.

*Q. vaccinifolia** and *Q. chrysolepis* var. *nana*. Need some shelter and sun.

Rhamnus californica. Many varieties and strains; northern ones need trial.

R. crocea (Coffee berry). Shelter, sun.

Rhus trilobata var. *malacophylla* (Squaw bush), *R. integrifolia* (Lemonade berry) and *R. ovata.* Shelter and sun.

Ribes speciosum† (Fuchsia-flowered gooseberry). Thrives with protection.

Romneya coulteri (Matilija poppy). Successful in milder Pacific Northwest sites.

EASTERN ASIA AND HIMALAYAS

Berberis asiatica. Leathery leaves; sun, shelter.

Camellia species like *C. reticulata* f. *simplex** and *C. saluenensis*†. Partial shade and shelter.

Cornus capitata†. Nearest our own *C. nuttallii;* sulphur-yellow bracts.

Euonymus ilicifolius. Unusual "spindle-bush" with evergreen spiny leaves.

*Lagerstroemia indica** (Crape myrtle). Large shrub with handsome bark and showy pink flowers. Mature specimens in the University of Washington Drug Garden and on the south side of the Arboretum Offices; flowers in a hot summer.

Loropetalum chinense[4]. Evergreen witch hazel for mild sites.

*Magnolia campbellii**. Superb, free-flowering tall tree for warmer districts; several cultivars of differing hardiness and flower.

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*Key to list:

* = growing in the Arboretum

† = growing in the Arboretum but considered tender

1, 2 or 3, etc. = number of times introduced into the Arboretum and lost to cold (but still considered worthy of trial there)

Mahonia. Pinnate-leaved barberries; besides the hardier *M. bealii* and *M. japonica,* try *M. lomariifolia*[2].

Rhododendron. More of the H-2 and H-3 rated species and hybrids should be tried. (H-2 = protection in sheltered gardens; H-3 = hardy in milder, coastal districts); see Bean and Hillier for particular examples for trial.

Vaccinium. Besides the hardier species like *V. ovatum, V. nummularia* should be tried on a sheltered shady bank.

NEW ZEALAND AND AUSTRALIA

Anopterus glandulosus (related to *Escallonia*). Sun, shelter.

Callistemon[7]. (The Australian bottle-brushes). Carl English was successful with these striking shrubs at the Ballard Locks in Seattle; need protection.

Carmichaelia[9]. Leguminous shrublets for the sheltered spot in the rock garden; need sun.

Casuarina nana (dwarf Australian she oak or beefwood). This and other species with delicate rush-like, jointed leafless branchlets; one thrives on wall at Forest Resources court, University of Washington campus.

Clianthus puniceus[3] (Lobster claw or parrot's bill). Striking red flowers on a rambling shrub; sun, shelter.

Corokia. Small evergreen shrubs with starry yellow flowers and red to orange fruits; *C. cotoneaster*† hardiest.

Drimys lanceolata[2]. Evergreen shurb or small tree.

Eucalyptus. Of the 500 or so species of Australasia, only a few can survive here with some protection; try *E. cordata, E. gunnii*†, *E. niphophila** or *E. nitens.*

Fuchsia. Besides the hardy *F. magellanica, F. excorticata* from New Zealand is desirable.

Gaultheria oppositifolia[1]. Showy evergreen with opposite leaves and white bells.

Grevillea. Evergreen shrubs with honeysuckle-like flowers; try *G. alpina* or *rosmarinifolia.*

Hebe. Though we grow many in the Pacific Northwest without special protection, some others need a little help; try some borderlines like *H.* × *sandersonii, H. lavaudiana*[2] and *H. macrantha.* The New Zealand hebes range from alpine to seacoast; the low elevation or North Island species need testing here, with protection.

Leptospermum. Myrtles of evergreen foliage; *L. scoparium*∞ and *L. humifusum*†.

Lomatia[1]. Fine evergreen foliage and attractive flowers; Hillier lists eight, all worthy of trial.

Olearia. Bush daisies of many sorts and differing hardiness; try *O. phlogopappa** and *O. macrodonta* in coastal gardens.

SOUTHERN EUROPE, NEAR EAST AND NORTH AFRICA

Anthyllis barba-jovis. Leguminous shrub with silver leaves and cream flowers.

*Arbutus andrachne** (Grecian strawberry tree). Tender only when young; sun, shelter; *A.* × *andrachnoides,* hybrid of *A. unedo,* hardier.

Chamaerops humilis. For those who must have a palm, this and *Trachycarpus fortunei* (China) are nice "dwarf" (3- to 10-foot high) samples.

A brilliant orange flower and the buds of *Punica granatum* (P. 11). Notice the fleshy calyces. Photo: Nancy Walz

Cistus. Several of the Mediterranean rock roses like *C. palhinhae** and *C.* × *skanbergii*[1] merit trial; sun, shelter.

Daphne jasminea. Evergreen alpine, fragrant; from Greece.

*Ilex perado** and *I. p.* var. *platyphylla**. Hollies from Canary Islands and Azores; large glossy evergreen leaves; shelter.

Olea europea†. (Olive). Small tree with gray-green, leathery leaves; wall protection.

*Punica granatum** (Pomegranate). Showy red flowers; rarely fruits with us.

Viburnum tinus. Varieties *lucidum** and *hirtum** better than the type but need mild conditions.

SOUTH AMERICA

Abutilon vitifolium[2]. Lovely mallow from Chile; sun, shelter.

*Aristotelia chilensis**. Evergreen shrub; likes seaside exposure, Chile.

*Azara microphylla**. Small evergreen tree with tiny leaves; shelter, partial sun.

Berberis coomberi. Argentina; several other South American barberries should be tried; sun, shelter.

Caesalpina gilliesii[1] (Bird-of-paradise). Shrub with exquisite flowers and foliage; hot, dry, protection.

Cantua buxifolia. Small shrub, tubular red flowers; Andes.

Crinodendron hookerianum[2] and *C. patagua.* Garden gems with red or white bells; sheltered, sunny wall.

Drimys winteri[4]. Evergreen shrub or small tree with fragrant, ivory-white flowers.

Embothrium coccineum† (Chilean firebush). Magnificent small evergreen tree; shelter, partial shade.

Escallonia. Handsome evergreen shrubs with gooseberry-like flowers; besides the well-known *E. rubra**, try *E. bifida (E. montevidensis)* and *E. revoluta.*

Eucryphia. Besides the hardier *E. glutinosa,* others like *E. lucida** and its var. *milliganii* and *E.* × *hillieri* merit testing.

***Corokia cotoneaster*, admired for its picturesque branching habit (P. 11). Photo: Nancy Walz**

Nothofagus. The Arboretum has experimented with several species of this attractive beech-like tree of the Southern Hemisphere; try species of higher latitudes.

SOUTH AFRICA

Very few species of the rich shrub flora of the Cape region have been tested in the Pacific Northwest; for a start try two of the many showy heathers: *Erica canaliculata* and *E. pageana*.

CONIFERS

Callitris. Evergreen small trees of Tasmania and Australia; need sheltered woodland.

Glyptostrobus lineatus†. Like bald cypress, needs water and protection.

Juniperus formosana. Graceful small tree for milder districts.

Larix griffithiana. (Himalayan larch). Sheltered woodland.

Phyllocladus. Curious New Zealand podocarps with flattened leaf-like branchlets.

*Picea smithiana**. The finest weeping spruce; only young plants need shelter.

Pinus patula†. A Mexican pine with gracefully drooping, bright green needles; see plants Carl English has grown against building at the Locks.

Podocarpus. Southern Hemisphere yew-like conifers; besides the few hardy ones *(P. alpinus*, P. andinus*, P. nivalis*,* etc.*) try some borderline species like P. dacrydioides, P. hallii*, P. salignus* or *P. totara**.

VINES AND OTHER CLIMBERS

Jasminum. Hillier lists several borderline species *(J. dispermum* and *J. floridum)*.

Lapageria rosea[1]. The gorgeous national flower of Chile; rose-crimson bells with fine evergreen leaves; shaded, sheltered wall in coastal areas.

Lardizabala biternata[1]. Like *Akebia,* but with twice-compound leaves; flowers chocolate-purple.

Mandevilla suaveolens (Chilean jasmine). Large white scented flowers.

Passiflora caerulea[1]. (Blue passion flower). Fascinating and intricate large flowers; dies back to survive underground in usual winters.

Trachelospermum. Several fine climbers, needing only a sunny, sheltered wall.

BAMBOOS

These elegant evergreen grasses are mostly tropical and too tender, but besides the few of known hardiness, try *Arundinaria falconeri, A. insignis* or *Phyllostachys viridis (P. mitis)** for borderline sheltered sites.

My preoccupation with growing plants at the borderline of their cold hardiness need hardly be justified. Although we can control light, moisture and soil conditions at least to some extent, the temperature factor is the most challenging and frustrating — so often beyond our control. But if the clever gardener (or fortunately situated garden — an even safer bet!) can accommodate plants of borderline cold hardiness, then surely the other borderline factors can be dealt with as well. Even with our low winter light conditions, south or west exposures with little shadow can assist the sun-tolerant species. Usually this light requirement goes hand in hand with low moisture and high temperature during the growing season. Well-drained, south or west slopes can give the proper mix of temperature-light-moisture needed for many California natives, Mediterranean rock roses and the like. The added protection of a hedge or artificial screen as a buffer to cut off the nasty north winds of midwinter will provide added insurance.

"Borderline," when applied to soil conditions, will most often mean that a species can, with some assistance from the gardener be made to grow in a substrate approaching in composition or acidity-alkalinity the conditions of its native habitat. Plants of limestone origins offer the most examples of soil-related tolerances; the use of limestone rock or dolomite rock as soil amendments usually solves the problem.

With such a wealth of plant material from all over the temperate and subtropical parts of the world that await proper testing in the coastal Pacific Northwest, it now only remains for the *doing* — to coax courageous or foolhardy gardeners into making the plunge. Carl English was one of such intrepid plantsmen. His successes are for all to see in that "banana-belt" microcosm, the Ballard Locks in Seattle. Moreover, these species once thought to be too tender for us are now widely grown with a good margin of safety; they were not as tender as expected. Many more habitats like the Locks exist around the Puget Sound and the Vancouver Strip. They need to be put to the test. Until I am convinced that a new glacial epoch is approaching, I will be willing to risk the occasional severe winter in payment for the enjoyment of growing fine and unusual plants in my garden on the safe side of borderline for at least a few years. ♠

Juki Iida and Henry Yorozu consulting on construction of the Japanese Garden in April, 1960. Photos: Joseph Scaylea, Courtesy of Seattle Times

JUKI IIDA

1889-1977

Members of the Arboretum Foundation will be saddened to hear of the death of Juki Iida, the internationally revered Japanese landscape architect.

Mr. Iida was not only the designer and creator of our Japanese garden in the Arboretum, but he personally supervised its entire construction. This was an unusual activity for a man at age 70 who ordinarily only watched his staff do the work, never turning a hand himself.

Many who remember the rainy spring of 1960, when the Japanese garden was built, will recall seeing Mr. Iida, ever in dark beret and raincoat, with white tennis shoes, meticulously directing the placement of each rock and plant. He earned the deep respect and affection of all who were privileged to work with him. The language barrier was easily broken by the genius and understanding of this great man.

In Japan, Juki Iida was renowned as the builder of more than a thousand Japanese gardens throughout the world. For his superior ability in his field, he was honored by the Emperor of Japan, the only man in Japan so honored in this activity.

Mr. Iida not only was a foremost landscape architect and designer, but as a businessman he owned his own stone quarry in Japan, employing many Japanese craftsmen in the constructing of Japanese stone lanterns. His firm also operated a number of nurseries found on the roof tops of the larger Japanese department stores.

Mr. Iida was a skilled horticulturist. Working with Mr. Moriwaki, head of the Tokyo Park Department and also one of the designers of our garden, he arranged for the moving of a thousand Ginkgo trees (six-inch diameter) to the Olympic games site in Tokyo. Every tree survived, although each was moved with only a nine-inch root ball! Mr. Iida stated to us, "Of course we did some preliminary work, but basically we knew how!"

In 1959 the Japanese government asked him to design and construct the Japanese Tea House Garden at their Embassy in Washington, D.C. This was just another of the many works he accomplished for his government.

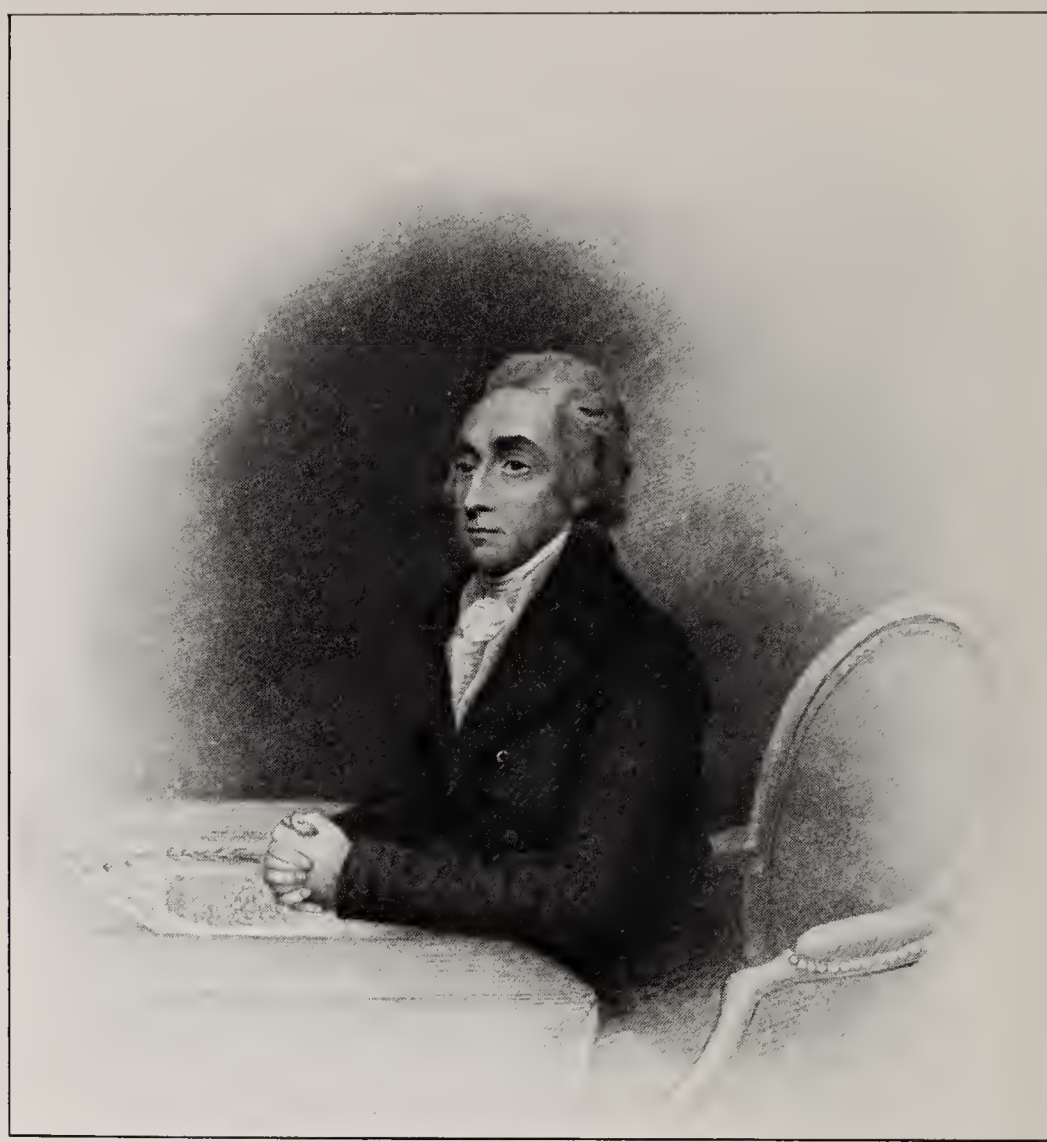
He visited Seattle several times after the construction of our garden, each time inspecting its progress and suggesting to Richard Yamasaki and William Yorozu, our builders, of ways to hasten its maturing. Only last year, nearing his 87th birthday, Mr. Iida visited the garden, gave many approving nods for the way it was maturing and seemed pleased with the progress.

At the time of his death he was working with us endeavoring to secure builders for the replacement of the tea house.

His ready smile and genuine manner will be greatly missed by his many friends here. Plans have been started to inscribe a stone in his honor, to be placed in the Japanese garden area.

KENNETH W. SORRELLS

Nature is Revealed, Art Concealed



Portrait of Aylmer Bourke Lambert. Frontispiece, Vol. 1 of his *Genus Pinus* (see References, No. 6).

*ROBERT D. MONROE**

When Goethe visited the library of the Grand Duke of Weimar and was shown the hand-colored plates for the first volume of Aylmer Bourke Lambert's monumental work entitled *A Description of the Genus Pinus* (6),[1] the great philosopher, novelist and poet, who was also both botanist and painter, expressed the deep pleasure he derived from Lambert's scientific accomplishment and from the artistic attainment of Ferdinand Bauer who had painted the majority of the life-size illustrations in the folio volume. "One is enchanted by the spectacle presented in these pages," Goethe later wrote in an essay on flower painting, "for nature is revealed and art concealed." (5.)

Goethe's high praise for Ferdinand Bauer's work was offered not only as a tribute to his artistry, but also in recognition of his skill in having brought to the level of a science what formerly had been, in Goethe's view, the mere representation of floral beauty. "We should not have imagined," Goethe continued, "that anyone would undertake to perform such a task had we not before us a few illustrations in which an artist succeeded in doing what had seemed impossible." (Ibid.)

Visitors to the rare book room in the Special Collections Division of the Suzzallo Library at the University of Washington may see a fine copy of the work Goethe praised so highly, although in the more extensive and somewhat later second edition in three volumes with lithographic reproductions in color of Ferdinand Bauer's original illustrations. This great work is one of the high points in an uncommon assembly of rare and unusual works in botany and in many other fields that belong to the rare book collection and the Pacific Northwest Collection of the Suzzallo Library, or to the Arboretum Collection which since 1968 has been deposited in the Suzzallo Library for safekeeping. Taken together, the botanical and other illustrated works in these three jointly administered collections comprise a rich and indispensible archive for the scholar, the student of art and the lovers of flowers and gardening, and also constitute a treasure trove of quite another character for the students of typography, design, fine printing and the craft of hand-binding.

By mention of these unique and highly varied bibliographical resources the purposes of this paper are suggested: to express our gratitude to the donors of such masterpieces of scientific and

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*R.D. Monroe, head of the Special Collections Division, Suzzallo Library, University of Washington, has kindly consented to write this article about selected works in the collections that he supervises. He was assisted in the choice of illustrations by Brian O. Mulligan. All photographs in this article were made by the University of Washington Library.

[1]The numbers in parentheses throughout this article coincide with the numbered references listed at the end.

artistic endeavor of past centuries, and to commemorate the lives and labors of botanists, illustrators and others of every period, whose works whether touched with grandeur or marked by utmost simplicity remain as viable as they ever were and still beneficial as sources of information and of ideas. Four such authors, botanists or illustrators, and certain of their works that are present in some one of the three collections have been selected to serve as models for the following sketches.

The first sketch offered will deal with Eleazar Albin (fl. 1713-1759), the author of a zoological work rather than a botanical one, a naturalist and painter whose work entitled *A Natural History of English Insects* (1) is present in the rare book collection of the Suzzallo Library. A second commemorative sketch will provide some little-known details of the short, tragic career of Sydney Parkinson (1745?-1771), botanical draughtsman with Captain Cook on his first voyage around the world in 1768-1771, whose posthumously published work entitled *A Journal of A Voyage to the South Seas* (8) read in conjunction with other modern sources gives us a basis for understanding the insurmountable odds against which he was obliged to work. A third sketch will discuss the life of Aylmer Bourke Lambert (1761-1842) from childhood to the publication of his *Genus Pinus,* while a fourth and final sketch will commemorate the recent work of the distinguished contemporary botanist, explorer and illustrator Margaret Mee (1908-) whose *Flowers of the Brazilian Forests* (7) may have added a literary dimension to botanical exploration and reportage.

Eleazar Albin

Writing in 1749 Eleazar Albin gave these assurances to his readers: "In all my Drawings, particularly of the Insects," Albin wrote, "I have copied exactly after the Life; having observed it a great Fault in those who have gone before me in this Way, that they either did not look often enough at their Pattern, or affected to make the Picture outdo Nature: This I have carefully avoided. So likewise in my Descriptions, I have chosen the plainest Words that I could find, and have always related with all possible Exactness mere Fact." (1, p. 6.)

There is little more to be said of Eleazar Albin as naturalist and painter save that he knew much of the difficulties involved in acting as his own publisher and in finding dependable subscribers who would underwrite the cost of the work: he knew more than a little about the loss of an esteemed patroness it seems. He recalled that his work went on apace "While this good Lady lived . . . and, I am persuaded, had been finished long since, if it had pleased God to have spared her; but after the loss of my Patroness, Subscriptions coming in slowly, and my Circumstances (having a great Family to provide for) not being able to carry it on without, retarded it." (1, p.5.) Ultimately, the patience of his subscribers was to be rewarded handsomely. When the new edition of Albin's *Insects* was ready for the public, and its 100 colored illustrations could be examined, it was found that among his subscribers were one royal princess and fully 99 worthy members of the nobility and the gentry. All were most agreeably commemorated upon their individual engraved and hand-colored plates.

The identification of Albin's high-born or distinguished patrons surely attracted more custom-

***Tropaeolum* sp. with caterpillar. (Plate No. 1.) Albin's *Natural History of English Insects* (see References, No. 1).**

ers, and the painter and his children may have gathered several times to add to the unbound stocks of hand-colored plates available for sale or for presentation. Copies judiciously sent to The Royal Society and to the librarians of other learned bodies could be expected to generate additional orders for full sets of plates. These Albin and his daughter Elizabeth — and likely other members of Albin's "great Family" working from models provided by the father — skillfully colored with their paints. At least a hundred copies of each of Albin's hundred plates would have been required to meet his obligations to his subscribers and undoubtedly additional copies were made for sale to other non-subscribers who were attracted to the work for one reason or another. Notwithstanding his attention to detail and his concern for accuracy, Albin's contemporaries and critics have not always held his work in high esteem. One account written in 1793 says of Albin, "His information in general is loose, miscellaneous, and unmethodical, though sometimes it is amusing and often instructive."

Sydney Parkinson

We turn now to the sadly contrasting figure of a lonely, cheerless draughtsman named Sydney Parkinson. He was to find great opportunity only to be swamped by the enormity of the tasks that confronted him, and he was to die young. His very name was to be expunged from the official account of the historic voyage he made with Captain James Cook, and his work was to lie neglected for many years — dependent upon the needs or the skills of others for its ultimate publication. The Pacific Northwest Collection holds a fine copy of his *A Journal of A Voyage to the South Seas, in His Majesty's Ship, The Endeavour.*

It is for good cause that Sydney Parkinson has been called the most important artist of Captain Cook's first voyage: he produced 1,300 drawings and sketches in the face of extraordinary hazards which ultimately were to take his life. His portrait which forms a frontispiece to his own posthumously published journal shows him as a sober young man and a studious one. His parents were Quakers and because of the father's untimely death Sydney and the other members of his family in Edinburgh were left "dependent on their own talents and industry for their future support," according to the editor of the journal. He also wrote that "Sydney was put to the business of a woollen-draper; but, taking particular delight in drawing flowers, fruits and other objects of natural history, he became soon so great a proficient in that stile of painting, as to attract the notice of the most celebrated botanists and connoisseurs in that study. In consequence of this, he was, some time after his arrival in London, recommended to Joseph Banks, Esq., whose very numerous collection of elegant and highly-finished drawings of that kind, executed by Sydney Parkinson, is a sufficient testimony of both his talent and his application." (8, p. vi.)

Alas, for poor Parkinson, talent and application were not enough. He was to die from the agonizing effects of dysentery and from overwork in 1771 following *Endeavour's* 10 weeks' stay at Batavia. When his papers and his many drawings were carried back to England at the expedition's end, they were to become the subject of much ugly contention and even litigation between Banks, who actually held legal title to them, and Parkinson's unbalanced brother, Stanfield, who ardently sought them. Unfortunately for Sydney Parkinson's reputation as a botanical artist, among the "elegant and highly-finished" drawings in Banks' possession there were also numerous others which Parkinson had produced under great stress and which were no more than preliminary sketches or ones deliberately left unfinished for future working.

J.C. Beaglehole has written of Parkinson's work and has this to say: "During the early part of the voyage Parkinson, by working extremely hard, was able to finish his coloured drawings of plants, though not of zoological subjects; and some of both sorts are quite exquisite." Beaglehole goes on to say that when the specimens that were collected in New Zealand were brought aboard *Endeavour,* Parkinson "could not keep up, and on the Australian coast he was overwhelmed. He was, it must be remembered, acting also as topographical draughtsman, mainly in wash, and doing the best he could for the figures. Some of his figure drawings, of course, are appallingly amateurish . . . The plan he adopted with the plants was to make pencil outlines, add a little colour to indicate the key, and make notes on the back for his guidance in finishing the work later . . . He sometimes was able to make a second, finished drawing himself, but not often. In

the end it was Banks' other botanical draughtsmen . . . who in England, over a long period of years, executed the finished water colour drawings, always sticking closely to Parkinson." (2.)

John Hawkesworth had attempted but failed to prevent the publication of Parkinson's journal in the same year as his own authorized account of Captain Cook's voyage. Also, Hawkesworth seems spitefully to have taken the steps to have Parkinson's name expunged from the text of the official account as well as from any illustrations by the artist or those based upon his sketches. Ludicrously, the engraver's name appears upon the plates but not that of the artist.

Parkinson was ever the loser. The publication of any major corpus of his work was to be delayed for 125 years as noted in *Great Flower Books:* "Engraving of the plates began in 1772; unfortunately their publication was delayed and, after the death of Banks's companion Solander in 1782, was postponed indefinitely and did not take place until the . . . issue in 1900-1905 of lithographed copies (3). They are of special interest to us as being at the time of their preparation the first representations of Australasian plants, but they do not do justice to the beauty of the original drawings now in the Department of Botany, British Museum (Natural History)." (9.)

Sydney Parkinson: Frontispiece by James Newton. In Sydney Parkinson *A Journal of a Voyage to the South Seas* (see References, No. 8).

Aylmer Bourke Lambert

Aylmer Bourke Lambert, undoubtedly knew of Eleazar Albin's old fashioned works on natural history, as well as the tragic story of Sydney Parkinson's unfinished work. Lambert had every reason to congratulate himself for having been born to advantages and so relieved of either the tedious business of supporting a large family, or of finding subscribers for his monumental work which commenced publication at London about 1803. He was the child of a well-to-do Wiltshire family and eventually fell heir to Boyton House and other property at Heytesbury. His personal fortune appears to have been adequate to support himself and his paid assistant David Don, and to engage the finest botanical draughtsman then resident in England — Ferdinand Bauer. Although Lambert admitted his paid assistant Don to the foot of his title-pages, the artist who was to secure Goethe's accolade and bring much other praise to Lambert's work was himself unnamed either on the title-page of the *Genus Pinus* or in its preface. His name appears upon the plates he created, however, where artists and engravers traditionally receive their due.

Wilfrid Blunt in his popular work entitled *The Art of Botanical Illustration* (New York, 1951), calls Ferdinand Bauer and his brother Franz "the greatest exponents of botanical drawing in England" after 1770, and states that Ferdinand's standards were so exacting that he could not entrust essential engraving or coloring to others and so often was obliged to carry the burden of all work himself.

Lambert is said to have been a precocious child and there is evidence abounding that he was at least a collector in natural history at a surprisingly early age. The writer of Lambert's obituary notice in *The Gentleman's Magazine* for 1842 spent nearly as much time discussing Lambert's formative years as he did in naming the accomplishments of Lambert's maturity. "Mr. Lambert could scarcely remember a time when he was not a collector," the obituary notice states. "Flowers, shells, and other beautiful minutiae of nature, were with him the sports of the nursery; and before he was old enough to be sent to

(Continued on p. 20)

(Continued from p. 17)
school, he had actually a spare room in the mansion at Boyton fitted up as a museum; humble enough, perhaps, in its contents, yet sufficiently indicative of his future pursuits and character . . ." (4.)

Fascinated by the deceased collector's uncommon childhood, the obituarist elaborated: "At twelve years of age he was placed at Hackney School. . . and also here he followed his favourite pursuit with ardour: his play hours were devoted to collecting specimens, and his pocket money, to the astonishment of his school-fellows, was regularly spent in purchasing beetles, butterflies, and such other objects as the rustics could procure for him. While here he became a subscriber to Curtis's *Flora Londinensis* at its first publication, and he kept up a small garden . . ." (Ibid.)

These efforts of Lambert's youth were by no means unattended nor carelessly directed. There must have been a doting family and numerous retainers to smooth his way. Undoubtedly he read of the exploits of Sir Francis Drake as did other boys of his time, but the handbook of Lambert's youth was his copy of William Hudson's *Flora Anglica; exhibens plantas per regnum Angliae sponte crescentes,* first published when Lambert was still an infant but in its second edition by 1778 when Lambert was 17.

The only elements still lacking in the development of Lambert as a full-blown collector of botanical specimens were soon-to-come maturity and those friends who could share his tastes or match his appetite. One of his earliest acquaintances was the Dowager Duchess of Portland, an amateur botanist, who possessed an herbarium which Lambert later was to acquire. He attended Oxford (although he did not graduate) and later met Daniel Lysons, James Edward Smith and Joseph Banks. Now the pattern of his future life was irrevocably set. "From the time of his leaving college to the present," his obituarist wrote, "his attention has been chiefly directed to the cultivation of his favourite science; and the part he has taken in it will be evident from his numerous, and some of them splendid, publications; and from the flattering tribute which has been paid him by other eminent botanists, who have agreed to name several newly discovered plants after him. The Genus *Lambertia,* from New Holland; *Hibiscus Lambertianus,* discovered by Humboldt and Bonpland; *Canna Lamberti; Erica Lambertiana; Verbena Lamberti; Oxytropis Lamberti; Salix Lambertiana;* and *Acacia Lambertiana,* may be mentioned as instances of the high respect which he attained in the botanical world . . ." (Ibid.)[2]

Lambert's botanical interests were all-encompassing as the world-wide scope of his vast herbarium which he collected suggests, but uppermost in his mind at all times was the *Pinus*[3] — not only as an ornamental tree but especially as a source of timber which could be grown more extensively than it then was in England, and which could "certainly prove of national importance" as Lambert wrote in the preface to the first edition of *A Description of the Genus Pinus.* It seems worthwhile to quote a longer passage from that preface of 1803 to gain the indispensable background it alone can furnish for our understanding of the vast work Lambert had undertaken in issuing the costly sheets of the *Genus Pinus.* Lambert wrote, "The difficulty and obscur-

[2]*Erica Lambertiana* = *E.* × *lambertiana; Verbena Lamberti* is now considered to be a narrow-leaved race of *V. canadensis; Salix Lambertiana* = *S. purpurea* var. *lambertiana; Acacia Lambertiana* = *Calliandra lambertiana.* In addition, the sugar pine of western United States is fittingly named *Pinus lambertiana.*

[3]Lambert's great work covered other conifers besides pines and, indeed, many others whose nomenclatural changes have since removed them, if not from the Pinaceae, at least from the genus *Pinus.*

Captions for color illustrations on page 18, and page 19 (clockwise from upper left).

***Citrus* sp. In John Miller *An illustration of the Sexual System of Linnaeus.* London, Vol. I, 1777. 36×53 cm. Rare Book Collection, Suzzallo Library.**

***Aristotelia peduncularis.* Plate No. 12. By Margaret Stones. In Winifred Curtis *The Endemic Flora of Tasmania.* Part I. London, The Aerial Press, 1967. 30×40.5 cm. Arboretum Collection.**

***Rhododendron camtschaticum.* Plate XXXIII. In Peter Simon Pallas *Flora Rossica, seu Stirpium imperii Rossici Per Europam et Asiam.* St. Petersburg, Vol. I, 1784. 29×46 cm. Rare Book Collection, Suzzallo Library.**

***Arctotis* sp. Plate XLIX. In Philip Miller *Figures of the Most Beautiful, Useful, and Uncommon Plants Described in the Gardeners Dictionary.* London, Vol. I, 1760. 26×42 cm. Arboretum Collection.**

***Panax quinquefolius* (Ginseng). Table 45. In William P.C. Barton *Vegetable Materia Medica of the United States.* Philadelphia, Vol. 2, 1818. 21×27.5 cm. Arboretum Collection.**

ity of the *Genus Pinus* have long been remarked and regretted by Botanists; and, though so many of its species possess peculiar recommendations to the attention of horticulturists, instructions have been wanting for their better cultivation and management. It is in consequence of the growth of this tribe having been little attended to, and of authors forming their descriptions chiefly from dried and mutilated specimens, that so much confusion has prevailed. Even Linnaeus himself seems to have been very partially acquainted with the changes produced by diversity of soil, and the various stages of growth; and the *Hortus Kewensis,* in which the species are certainly much better distinguished than in any other work, does not enumerate all that are now known, nor does it in every instance discriminate their characters correctly . . . Conceiving therefore a new arrangement of the Genus to be particularly desirable, I have devoted my attention to it for some years, and have not failed to apply to every source of information connected with the subject, having visited every plantation within many miles of the metropolis, and consulted every author of repute, with a view not only to ascertain the most accurate specific distinctions, but also to collect every fact relative to the culture and uses of every individual species."

Although some 21 years were to elapse between the issue of the 43 plates belonging to the first volume of the *Genus Pinus* of 1803, and the additional 12 plates which made up the second volume dated in 1824, the great second edition of the work appeared only four years later in 1828. The new preface provided by Lambert for the second edition explains something of the information explosion of the mid-19th century. "This new edition of my work on the *Coniferae,* which I have long contemplated, will be found to comprise, besides all the species contained in the two former volumes, plates and descriptions of many new and highly interesting subjects, which, either from want of sufficient materials, were not included in the second volume, published in 1824, or have been discovered since its publication . . . The more frequent intercourse with foreign parts, and consequently the greater facilities which scientific travellers find in visting the remoter regions of the earth, have tended infinitely to enlarge our views in every branch of Natural History, not only by the vast increase of new species, but by the accession of a rich fund of interesting facts and observations."

Cornus florida. **Plate No. 28. In Constantine Samuel Rafinesque *Medical Flora; or, Manual of the Medical Botany of the United States of North America.* Vol. I, Philadelphia, 1828. 10×18 cm. Rare Book Collection, Suzzallo Library.**

Whether as students of science, of art, or of bibliography, we are fortunate to have a set of the second edition of Lambert's *A Description of the Genus Pinus* available for our study and examination. The Arboretum's superb copy of this great work was received as the generous gift of Mr. Prentice Bloedel in 1964.

Margaret Mee

Margaret Mee is an astonishingly versatile and courageous botanist, and there can be little doubt that her illustrations for the remarkable *Flowers of the Brazilian Forests* (7) are among the finest that have been painted in this century. These portraits — for that is the only term to be employed in speaking of her illustrations of exotic foliage and blossoms — are as specific in their definition as they could be and resolute in their hue, but they are *not* totally realistic. If such plants and blossoms as she paints are ever flawed or misshapen, or have broken stems, or leaves that forest insects have fed upon, Ms. Mee's pencil does not record it. The specimens depicted in *Flowers of the Brazilian Forests* are so nearly perfect that one is likely to think of them as growing in a solarium or protected as museum

pieces. And, of course, for Margaret Mee they do dwell in the museum-like jungle in which she wanders. Roberto Burle Marx has written of an excursion he made with Margaret Mee to collect "rare plants hitherto not cultivated." "She has the desire," Marx writes, "to identify her discoveries and the joy of sharing them with plant lovers. It is this which takes her into the forests as an explorer, braving poisonous snakes, illness and more, in order to arrive at the supreme moment of flowering, the moment when nature seems to reveal herself in all her beauty, mystery and luxuriance. The artist takes advantage of this magic moment to discover and to portray an infinite series of secrets and revelations, rich in colour and form." (7, p. 9.)

Nor are the secrets and revelations that Margaret Mee portrays revealed by her drawings only. The text of her ecological statements accompanying each drawing conveys her impressions of sea and jungle in language more suggestive of the contemporary poet than the scientist.

"We walked in the shadow of the trees, for the beach was shimmering with the heat of the midday sun. There was no shade when we reached Praia vermelha (red beach), so we wandered beside the raging sea. The Atlantic Ocean sweeps into this bay with a fury that never abates, breaking over the rocks with a deafening thunder. The sand gleams red-gold." (7, p.52 at Plate 10.)

Ms. Mee's work is filled with passages of this character. For her the shimmering beach, the gleaming sands, and the "supreme moment of flowering" which she awaits are verities which lend their splendor to her pen.

"At last we came to the cool, dark woods again, where I found many flowers, then new to me: orchids, Heliconias and a beautiful violet *Crinum.* A long, slender snake *(caninana)* hung in the branches of a *Clusia,* watching us with curiosity. It climbed nearer to get a better view of the intruders, and we could see its markings, black diamond shaped lines on a yellow-green ground.

"The light was dazzling as we came into the open over the rocks towards a small beach. In these grey stones grew bushes of *Solandra scandens,* the creamy, bell-shaped flowers scenting the air with a heavy, sweet perfume. Begonias clung to the humid faces of the rocks, and mingling with Anthuriums and Gesneriads, filled the cracks and chasms with a verdant green." (Ibid.)

Flowers of the Brazilian Forests was acquired for the Arboretum Collection in memory of Otto E. Holmdahl, with funds bequeathed by him.

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On opposite page:

***Solandra scandens.* Plate 10. in Margaret Mee *Flowers of the Brazilian Forests* (see References, No. 7).**

Adenocarpus decorticans **flowering in May. Photo: Brian O. Mulligan**

Leaves from a Collector's Notebook

BRIAN O. MULLIGAN

Adenocarpus decorticans

Adenocarpus is a small genus of shrubs in the pea family (Leguminosae) comprising no more than 10 species. Most of these are native to Spain, Portugal and North Africa, although they extend northwards into France and westwards to the Canary Islands. Botanically they seem most closely related to *Ulex,* the English gorse or Irish whin shrub, and to the larger and more varied genus *Genista*. They are readily distinguished from the former by the lack of any spines, and from the latter primarily by the gland-dotted pods. In addition, they are usually taller and of more open habit than most species of *Genista,* and the leaves are always trifoliate.

In January, 1955 the Arboretum received seeds of *A. decorticans* from Mr. N.G. Hadden of Porlock, Somerset, England. Only one specimen appears to have been raised to planting size and this was set out against the south wall of the greenhouse in May, 1957. It flowered for the first time a year later, by which time the plant had reached four feet in height. By 1970 it was nine feet tall and wide and had endured a number of testing winters without serious harm, flowering profusely in most seasons as the photograph shows.

The typically pea-shaped, slightly fragrant flowers are borne in short racemes of 12 to 20 at the ends of the shoots. They are golden yellow with the two wings slightly more orange on the upper side; the upright standard is about ½ inch high by ⅝ inch wide, conspicuously furrowed down the center; the peduncles, pedicels and calyces are all densely pubescent.

The pods are oblanceolate, 1½ to 1¾ inches long, ¼ inch wide above the middle, tapering to both base and apex, pale brown and dotted all over with dark glands; they are usually single-seeded.

The young shoots are white with projecting hairs that give a very soft feeling if handled during the summer. The general color effect is light gray, aided considerably by the silky pubescence of the trifoliate leaves; their linear leaflets are about ½ inch long on a slightly shorter petiole.

An interesting feature of this shrub is the brown fibrous bark which peels off in strips to

show the lighter colored wood beneath; the specific name, *decorticans,* is evidently derived from this character.

Several more plants were propagated by cuttings from this original one and planted out in the *Cistus* section in June, 1969 and again two years later. Two plants now remain here (August, 1977), one of which is even wider (11 to 12 feet) than its parent outside the greenhouse and is in vigorous health. The other has only one live branch, apparently having been attacked by some fungus disease.

This unusual and ornamental shrub is native to the mountains of central and southern Spain and those of Morocco and Algeria. It is reported to prefer calcareous soils, which are certainly not available in this Arboretum. Since in 20 years here it has never been seriously damaged by cold weather, it is evidently much hardier than one would suspect from its appearance. The plant in the *Cistus* area is sheltered by a large tree of California laurel *(Umbellularia californica)* on its south side but open to the north; the soil is very light and well-drained.

In the revised eighth edition of W.J. Bean's *Trees and Shrubs Hardy in the British Isles,* Vol. 1 (1970), this shrub is noted as being "only really hardy in the milder parts of Great Britain," but our experience here would seem to suggest that this statement should be qualified and that the plant should be tried in sunny situations on light soils. Its qualities of both foliage and flowers certainly well merit such a trial.

The only other species of *Adenocarpus* now in the Arboretum is *A. complicatus,* which extends in various forms from central France around the north side of the Mediterranean from Portugal and Spain to Italy and Greece. Plants raised from seeds received from the Botanic Garden at Coimbra, Portugal were set out in May, 1975 at the extreme south end of the Leguminosae area, on the east side of Arboretum Drive. One of these flowered this summer and is now about three feet tall and four feet across. Judging from previous experience with seedlings of the same species which flowered in 1954 and were killed by the abnormal early freeze of November, 1955, it can be expected to form a twiggy bush four to six feet in height resembling some species of *Cytisus.* However, in garden value it is much inferior to *A. decorticans.* ♠

WOODY PLANTS

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Compiled by
Brian O. Mulligan

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"I am impressed, as always, by the great wealth of plants collected, essentially in 30 years, I believe. It seems a monumental accomplishment . . ."

— From Dr. Benjamin Blackburn, professor at Cook College of Rutgers State University, and founder of the Willowwood Arboretum at Gladstone, N.J.

This catalogue lists over 4600 plants with sources, dates of planting and grid reference on new map.

Bribes, Decoys and Ant Guards

*B. J. D. MEEUSE**

The flowering cherries of our Arboretum certainly are a major attraction in the springtime, when the trees are in full bloom. Loyal *Prunus* fans will, of course, observe their trees later in the year too, when the leaves have come out fully, and I have often been asked questions about the identity and the significance of the little "warts" which can be found on the leafstalks, or at the leaf bases, of many species and varieties. With a hand lens, one can easily see that the warts are crater-like; they are often filled with a fluid which glitters in the sun (Fig. 1). Some of my friends are almost indignant when I tell them that the warts are *extrafloral nectaries,* and that the fluid is a real nectar, secreted by these small, gland-like structures. Somehow, these doubting Thomases have embraced the idea that nectar, by definition so to speak, can only be found in flowers! Clearly, it is not at all superfluous for us to look at both floral and extrafloral nectaries in a wide framework, so that we can make educated guesses about their origin and function.

The vital importance, to certain plants, of *floral* nectar has been recognized since the days of Sprengel (1750-1816), who is revered by many as the father of floral biology; it is one of the possible rewards or "bribes" which a flower-visiting insect, bird or bat may find when it renders its pollination services, and can thus be seen as a crucial element in a plant's sexual reproduction.

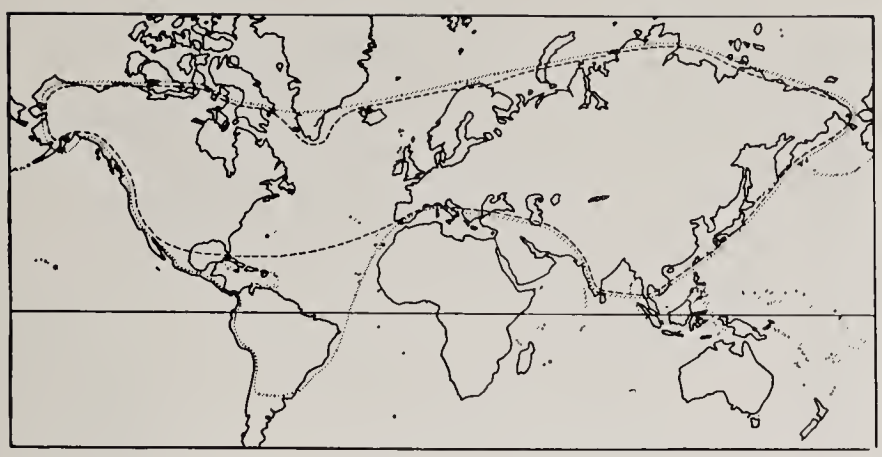
Studies of nectar and nectaries have neatly confirmed the existence of mutual adaptations between certain flowers and their pollinators. For instance, a flower such as a fuchsia, pollinated by small hummingbirds (warm-blooded animals with an extremely high rate of metabolism, requiring a high daily intake of calories), produces copious quantities of nectar which, however, is not strikingly concentrated; the latter fact agrees with the consideration that a hummingbird, with its special feeding method of sucking up nectar through the tube formed by its tongue, could not possibly handle a fluid that was too syrupy. Horse chestnut flowers, on the other hand, produce a nectar which is smaller in volume but may have a sugar concentration as high as 70 percent. The pollinating honeybees and bumblebees are able to suck up even this gooey material because they can first dilute it with a bit of their own saliva![1]

The particular timing of nectar secretion also testifies to the close mutual adaptation between certain flowers and their pollinators: in general, the daily production peak coincides neatly with the period of maximum activity of the pollinating animals or just barely precedes that period.

Finally, the position, size and shape of the floral nectaries may make it possible for certain plant species to discriminate against certain flower visitors while favoring others. One of the nicest examples is provided by the genus *Aconitum,* monkshood. Only large and long-tongued bees such as bumblebees *(Bombus)* and carpenter bees *(Xylocopa)* are able to get at the nectar produced by the long-stalked, paired nectaries (Fig. 2). The claim has been made that the geographical distribution of *Aconitum* and that of *Bombus* coincide almost exactly (see map). Although one area in South America seems to be exceptional in that *Bombus* is lack-

*Dr. Meeuse, Professor of Botany, specializing in plant physiology at the University of Washington, is a valued member of our Editorial Board. Over the years his contributions to the *Bulletin* have reflected his overriding interest in plant and animal interactions, articles such as "Butterflies in the Arboretum" (39:2 and 3), "Seeds and Fruits and their Dispersal Strategies" (36:3 and 37:1) and "What's New in Pollination" (35:3).

[1]Being too generous with nectar is, of course, not a "wise" strategy for a plant. After all, its energy budget is limited, i.e. the plant can "afford" to invest only so much in nectar for purposes of reproduction. Also, if the amount of sugar per flower were made very high, a single visit might satiate the pollinator, the animal would not proceed to other flowers, and as a result cross-pollination (which in general is a very desirable thing in nature) simply would not be forthcoming.



ing, it is more than likely that carpenter bees take over the bumblebees' role there. The slipper-like floral nectaries of love-in-the-mist *(Nigella damascena)* are even more complicated than those of monkshood; Sprengel called them *Saftmaschinen* (sap machines), and indeed, they can only be operated by "intelligent" flower visitors — which in this case include honeybees *(Apis)* — capable of lifting a lid-like structure (Fig. 3). Figures 4 and 5 give an idea of the variation one may encounter in the observation of the nectaries of flowers.

It is now time to ask the $64 question: how did floral nectaries arise in the flowering plants? The latter have not been on this planet very long: only since the Cretaceous era. Did floral nectaries appear on the scene like a pleasant bolt from the blue, exactly at the moment in geological history when they could contribute significantly to the survival of the new plant type?

Fig. 1. Extrafloral nectaries on the leafstalk of *Prunus serrulatus*.

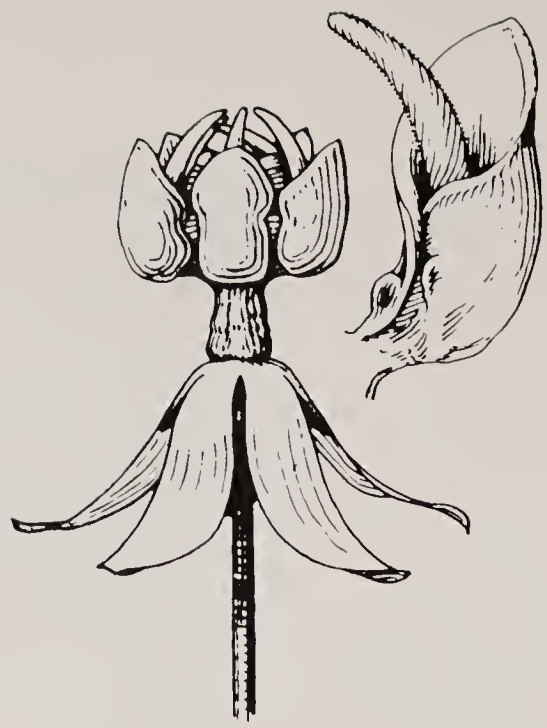
Photo: B.J.D. Meeuse

Photo: B.J.D. Meeuse

Fig. 2. Flowers of monkshood *(Aconitum napellus)*. The one at left is dissected to show the long-stemmed, horn-shaped nectaries.

To find plausible answers, it is instructive to look at the situation in, for instance, bracken fern, *Pteridium aquilinum*. Although it is not a flowering plant, we can still legitimately consider it for purposes of comparison, since there can be little doubt that the ancestors of our flowering plants were, in several respects, fern-like. When the leaves of bracken fern emerge in the spring, one notices that they have at their base active, glistening nectaries. In Wales, these are used as a source of honey by hive bees. Apart from their "useful" role in that respect, there has been a great deal of speculation about their possible function in nature; could it be that they attract certain belligerent insects, e.g. ants, which would tend to scare away or kill off harmful animals such as leaf-eating caterpillars? It does not seem likely. In all sorts of habitats, the number of insect visitors apart from honeybees, is woefully small, and ants are not strongly represented among them. It can furthermore be argued that bracken fern is not really in need of much protection, since, according to some investigators, it contains chemical compounds which mimic certain insect hormones and are thus capable of fatally interfering with the metabolism or the life cycle of any would-be herbivorous insect.

So, a purely *physiological* explanation for the presence of nectar on young bracken leaves, and even in the extrafloral nectaries which we noticed in the flowering cherry trees, merits consideration. One can indeed make a case for



L. to R.: Fig. 3. Flower and nectary of *Nigella damascena*. Fig. 4. Flower and nectary of a milkweed (*Asclepias* sp.). its nectar can be so abundant that it was collected as a sweetener by some American indian tribes. Fig. 5. Flower and cornucopia-shaped nectary of Christmas rose (*Helleborus* sp.). The nectar is collected by hive-bees in early spring for its rich sucrose.
Drawings: Hilda Kern

the idea that nectar represents an excess of "phloem sap," the fluid which moves through a special part of the vascular bundles of a plant (the phloem). It transports to the underground organs and also to developing buds, shoots, flowers and fruits the sugars which leaves produce through photosynthesis. The excess sugar becomes available when the "sugar-guzzling" development of the plant organs in question reaches completion. In other words, the excretion of nectar may well be due to the fact that the sugar-consuming systems (e.g., developing buds) and the sugar-producing, or sugar-mobilizing ones (the leaves) are no longer "attuned" to each other.

It is probably significant that, in the flowering plants, extrafloral as well as floral nectaries are most often found *at the base* of shoots, leaves or modified leaves such as petals, and that the beginning of their activities usually coincides neatly with the termination of the growth of the plant organ that bears them. In a number of cases, one can indeed demonstrate that there is a direct, physical connection between the nectaries (or nectar glands) and vascular bundles via phloem elements. The facts just mentioned may also explain why the secretion of sugar by nectaries is influenced by all sorts of environmental circumstances as well as by the "disposition" of the whole plant.

In view of all this it is not surprising that A. Frey-Wyssling, the famous Swiss botanist who was among the first to point these things out, originally referred to nectaries as *Saftventile* (sap valves). However, he himself soon pointed out that his theory was too simplistic and did not do full justice to the real situation. Nectaries sometimes are far from being entirely passive; e.g., nectaries which secrete sucrose are capable of synthesizing this substance from its component sugars, glucose and fructose, when the latter are introduced in the phloem. Frey-Wyssling's original theory also fails to explain why the conspicuous crater-like nectaries on the leafstalks of our *Prunus* trees *(Prunus serrulata* is an excellent example!*) remain* active and attract ants, bees and wasps as late as October, at least four months after the flowering season, at a time when the leaves involved are already beginning to display their yellow and red fall colors and certainly are no longer growing.

What, then, can we salvage (or derive) from Frey-Wyssling's theory? Mostly the idea that *originally,* in the immediate ancestors of the flowering plants, extrafloral nectar represented excreted phloem juice or modified phloem juice. When those ancestors began to make the structures we refer to as "flowers," the extrafloral nectaries must have been incorporated into them. However, granting a purely physiological origin of extrafloral (and floral) nectaries, one must still concede the essential inevitability of their rapidly assuming an ecological function in geological time in the sense of attracting potentially useful insects. After all, sugar is a most valuable, easily digestible food, which is tasted as sweet by a large array of insects, some of whom can perceive the presence of sugar in much greater dilution than man. An example of the latter situation is found in the red admiral butterfly *(Vanessa*

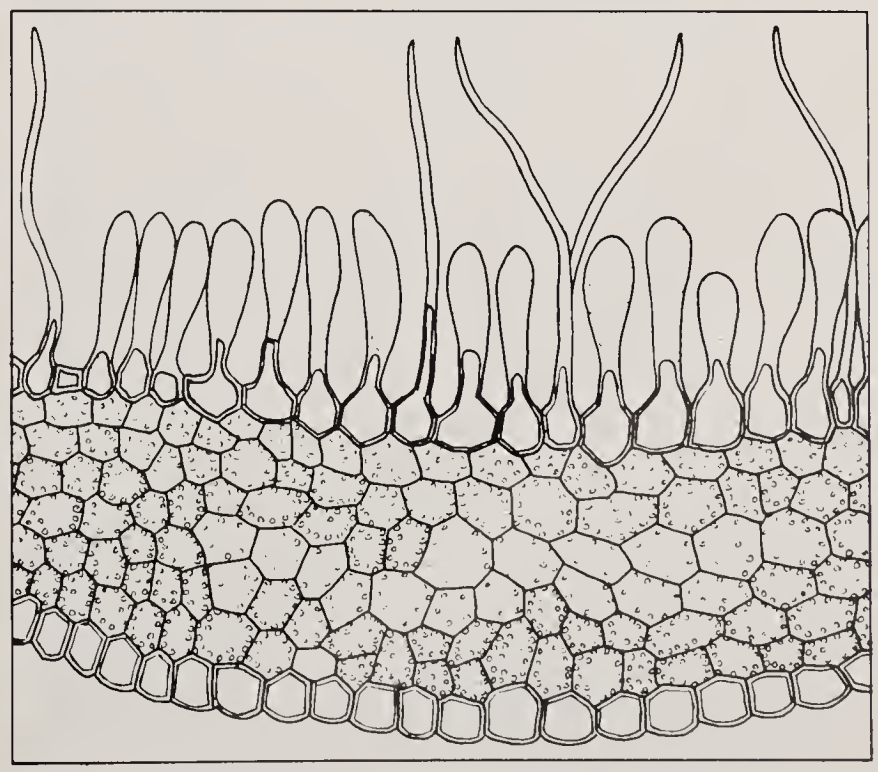
atalanta) the possessor of taste organs in its feet which are about 150 times as sensitive to sucrose (table sugar) as the human tongue. Ants, which as we shall soon see are more important for our present discussion than butterflies, are not quite as discriminating as the red admiral, but such species as *Myrmica rubra* and *Lasius niger,* which taste sucrose in dilutions of 0.17 and 0.10 percent, respectively, can still leave us humans far behind.

The two main theories concerning the ecological role of extrafloral nectaries are diametrically opposed. About a century ago, Anton Kerner von Marilaun pointed out that, as far as pollination is concerned, ants are "undesirable aliens" or "unbidden guests." He supposed that they will just steal nectar without rendering any substantial service in return and argued that even if an ant were to touch a dehiscing anther receiving pollen on its body, the grains would not easily stick to the hard, smooth body surface; also, transport of pollen from one flower to another by wingless insects is, at best, laborious and time-consuming. In 1878 Kerner devoted a whole booklet to the various defenses which flowers, in the course of evolution, allegedly have set up against unbidden guests (among which worker ants are the most important). Teasel plants *(Dipsacus silvestris)* have impassable pools of water at various points around the lower part of the stem; each pool is kept in position by the united bases of a pair of opposite leaves. In the case of Nottingham catchfly *(Silene nutans)* and some other silenes, sticky zones are present on the upper part of the stem below the flowers, constituting a formidable barrier against ants.

However, even in the case of structures in or near flowers which are clearly defensive, one must take with a grain of salt Kerner's interpretation that they act as *anti-ant* devices; there are other potential evildoers! For example, the roofing-in of the nectar-secreting base of a corolla to form a closed cavity may well be "intended" to act against pollinating *birds,* whose probing bill now has less chance of damaging the vulnerable ovules. Hairy structures in the tube of a corolla may indeed favor long-tongued hawkmoth pollinators and discriminate against ants, but may also have the function of protecting the nectar against dilution by rainwater. Et cetera!

One can also challenge Kerner's contention that certain extrafloral nectaries, such as those found on the stipules at the base of the leaves of some vetch-species (e.g. *Vicia angustifolia* and *Vicia faba* — the latter is also known as broad bean or fava bean) act as "decoy nectaries," drawing the attention of ants that are on their way up on a plant, and thus directing them away from the flowers. These *Vicia* nectaries (Fig. 6) are indeed conspicuous by their dark color and just glitter with nectar in the sunlight. However, anyone who has ever watched the ants in action can immediately point out that the animals are not kept away from the flowers at all but are "all over the place"; if the strategy of the vetches involved really were aimed at keeping the ants away from the plants' reproductive organs, they would be much better off by not having any conspicuous,

Fig. 6 (left). *Vicia angustifolia*. The extrafloral nectary is the black dot at the base of the stipule. Notice the visiting ant above. Fig. 7 (right). Cross-section through the extrafloral nectary of *Vicia sepium*, showing the complexity of its structure. Photo & drawing by B.J.D. Meeuse



dark, glittering, attention-drawing and nutrition-producing nectaries! The same argument can be made for the conspicuous, light-colored extrafloral nectaries of the castor bean plant, *Ricinus*.

In the opinion of many modern investigators, it is much more likely that the insects (the ants) in these cases constitute an *ant guard,* which protects the plant, perhaps against herbivores, perhaps against potential pollinators that might tend to burglarize the flowers and should be kept on the straight and narrow path of legitimacy.[2]

The idea of an ant guard finds strong support in observations made by L. van der Pijl and others in the East Indies on the strong and sturdy flowers of *Thunbergia grandiflora,* whose nectar is hard to get at even for a powerful bee. An almost incredible triangular relationship exists between the flowers, the large carpenter bees that are capable of pollinating them but have a strong tendency to burglarize, and the belligerent ants that are present on the bracts surrounding the base of the flowers. In spite of the size difference between the two types of insects, the ants force the carpenter bees to follow the legitimate path and thus pollinate in the normal manner. *Thunbergia grandiflora* flowers with an ant guard are never robbed, while those of related species without one are invariably bitten through at the base and robbed.

Ants, attracted by extrafloral nectar, have also been shown to be protective in the case of passion vine, *Passiflora;* in this plant, the protection is directed against herbivores.

Finally, Kathleen Keeler of the University of Nebraska has elegantly provided further evidence for the ant guard idea in a tropical morning glory, *Ipomoea carnea.* In addition to the floral nectaries, this plant has two types of extrafloral ones — on the leafstalks and on the flowerstalks. It is very significant that there is no overlap between visitors to floral and extrafloral nectaries. The former clearly serve the purpose of rewarding pollinators, while the latter cater (mostly) to ants. The extrafloral nectaries on the flowerstalks appear to be effective against flower-robbing, while those on the leafstalk act against herbivores and thus tend to protect against leaf damage.

In summary, we can say that in the few cases investigated the ant guard idea for extrafloral nectaries — which assigns a very positive role to ants — now enjoys a better intellectual standing than the alternative proposition that these nectaries act as decoys for ants with somewhat "criminal" tendencies.

This article would not be complete if we did not say a few words about the so-called "false nectaries" of *Parnassia,* structures which alternate with the stamens and remind one of the hand of a frog suffering from polydactyly (Fig. 8). At the tip of each "finger," one finds a shiny knob, imitating a droplet of nectar. Kugler has been able to demonstrate that these pseudo-droplets *do* attract flies! It has also been shown that the false nectaries are not totally false, but offer visitors at least a tiny amount of nectar, which is produced in two small spots on the broad surface.

(See next page for references)

[2]A third alternative, namely that the *Vicia* nectaries have no function at all and are just "freaks of nature," can be rejected immediately for the following reason: they are very complicated structures (Fig. 7). In order to get the black effect, at least two layers of cells containing differently colored substances must cooperate; there must be special sugar-secreting cells, and these have to be arranged in a very regular fashion on the inside of the small "bowl" which represents the nectary; et cetera. For each single nectary feature, the plant must possess a special genetical factor, and this means that in order to maintain a complete, integrated extrafloral nectary the *Vicia* plant must maintain a whole array of genetical factors whose combined "task" is to create it. One feels tempted to make a comparison here with the vertebrate eye, which likewise requires the maintenance of a whole array of cooperating genetical factors — a definite "effort," if one wants to put it that way. As soon as it is no longer necessary for an organism to have eyes (for instance in certain fishes and salamanders which for untold generations have been living in dark caves) we see that the genetical maintenance system for eyes is given up; in many instances, indeed, modern cave dwellers are blind or nearly blind, the eyes have "disappeared." By analogy, we can argue that the complicated extrafloral nectaries of *Vicia* would have disappeared long ago if they had no function.

Fig. 8. Flower and false nectary of *Parnassia palustris.*

Drawing: Hilda Kern

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Book Reviews

WILD AND OLD GARDEN ROSES, by Gordon Edwards. Hafner Press, New York, 1975. Illustrated. 162 pp. Price $9.95.

The English author of this book is an honorary vice-president and a member of the Council of the Royal National Rose Society of England. He already has one book to his credit on another aspect of the same subject, *Roses for Enjoyment* (1962 and 1973).

However, he did not become interested in the wild roses, the species, until he had to plant a new garden in 1960, or in the old garden types until even later. This work is a compilation of extracts from other earlier authors, particularly Graham S. Thomas (to whose research and writings he expresses deep gratitude), E.A. Bunyard (1936) and Roy E. Shepherd (1954), as well as Thomas Rivers and Mrs. C.F. Gore in the last century. These extracts are accompanied by notes from Mr. Edwards' own experiences in growing some 140 kinds of species and old garden roses. Regrettably he does not tell us anything about the location, climate or soil conditions in his garden, information which might have been useful to readers.

In addition to 13 chapters, there are an introduction, glossary, two appendices and an index. Of the 13 chapters, 8 are devoted to different groups such as the wild roses and their close relatives, Rugosa, Alba, Centifolia, climbers, etc. The number of kinds discussed or mentioned in each group varies greatly, depending chiefly upon current availability in nurseries. China and Alba roses have only 5 and 8 representatives respectively, whereas the Bourbons and Rugosas are represented by 19 each and the Gallicas by 21.

The emphasis throughout the book is clearly on the decreasing number of old roses now available, even in comparison with 10 or 12 years ago. Whereas in 1964, the author tells us, about 390 kinds were to be found in English nurseries, by 1974 this had decreased to 262, of which 80 were to be found in only one nursery.

The situation in this country is probably even worse. It would seem well worthwhile, as a matter of preserving these old plants, to discover just how many kinds are still being grown in the United States and Canada and to publish a list of them, with sources. It might then be possible to add to principal collections as others were discovered. The University of Washington Arboretum possesses more than 50 species, together with a small number of older hybrids. The American Rose Society would seem to be the logical body to undertake such a task, if it has not already been commenced.

For anyone interested in or already growing these kinds of roses, Mr. Edwards' book would be helpful, since he mentions the size the plants can be expected to reach, methods of cultivation, scent of flowers and leaves (if any), susceptibility to diseases, uses in the garden, plants to associate with them and so on. Thirty-one color plates are included, nearly all of good quality and accurate coloring, with the glaring exception of the Chinese species *Rosa moyesii* which should be blood-red and instead is deep pink with a purple flush! Most of these illustrations are the work of the late Harry Smith, a skilled and experienced photographer of flowers of all kinds. They are supplemented by 38 line drawings by Denys Baker, mostly of flowering branches but also a few showing fruits.

The book is well-produced as far as paper, typefaces and binding are concerned, although the margins seem excessively wide and wasteful of space. Boldface type is used for principal plant names. A few typographical and other errors have been noted, such as *marcophylla* for *macrophylla* (p. 47), and the persistent use of "Königen" for "Königin" (pp. 52, 70 and Index). *Rosa hugonis* was named for its introducer, Father Hugh Scallan, a missionary in western China. *R. woodsii* would not be regarded as a particularly ornamental species in its native western United States, although it receives considerable praise, extracted almost verbatim from Hillier's *Manual of Trees and Shrubs,* while the more decorative *R. nutkana* is not mentioned.

However, these are comparatively small quibbles. On the whole one can recommend the book as a useful introduction to these kinds of roses, but not for a serious student.

BRIAN O. MULLIGAN

REFLECTIONS FROM THE NORTH COUNTRY, by Sigurd F. Olson. Alfred A. Knopf, New York, 1976. Price $8.95.

A sense of discovery permeates Sigurd Olson's* latest book, *Reflections from the North Country.* Those who have read his earlier works, including *The Hidden Forest, The Singing Wilderness* and *Wilderness Days,* will find this series of essays singularly appealing. They sum up his philosophy. They are alive with insight and anecdotes about those areas he has traveled from the northern United States, the mountains of Alaska to the Northwest Territories of Canada. The author's experiences have not been concocted or imagined but vitally

lived. Whether traveling by canoe or backpacking into wilderness areas, he has encountered hardships with humor and met acute loneliness with a spirit of adventure.

Reading *Reflections* one is more and more delighted with Sigurd Olson's freshness of observation and his incisive descriptions of the parts of the world he has explored. To quote from his essay on harmony he writes, "In wilderness harmony is the natural way of life as it has always been but we must not destroy by any exploitative use or overcrowding that might change it." Then he continues in the same vein, "I eat my meat to the singing of birds back of my tent. This to me is balance and wisdom and I know the whole world is a matter of adjustment." Then in a somewhat saddened, somber mood he writes, "We speak blithely of conservation, the environmental movement, forgetting the basis of everything is harmony."

In another essay titled "Balance and Order," Sigurd Olson continues his observations, "If balance is part of the natural world, what is there in such knowledge that can be of value to modern man? I survey the wilderness about me, its woods, waters and living things — I know there is no peace nor any future for man without the same balance in our lives." The keynote of his whole philosophy is summed up in the following phrase, "Nature is always in a state of equilibrium and only when we manipulate it for our own purposes do we contribute towards imbalance." In the essay on freedom he says, "If you want to enjoy it you must recognize your responsibilities as adult humans living in a world with others. Freedom gives no one license to change a heritage that belongs to the ages."

For those who may prefer a condensed version of *Reflections,* there is one in the January, 1977 issue of *National Parks and Conservation Magazine.* The ideas here expressed strike a responsive chord, "With the romantic era of expansion long past, we ponder the mounting environmental and sociological crises. We no longer face a physical frontier but a change in philosophy, a complete reversal of our attitude towards the earth that might open the door to a golden era more resplendent than the old." These thoughts are not unlike those expounded by other dedicated conservationists. Men like Aldo Leopold, Robert Marshall, Benton McKay and Olaus Murie all marched to the same drummer!

To this reader, this remarkably well-written book has a satisfying and delightful flavor. It contains the philosophy of one who has depth of insight as well as observation and a sense of the complete wholeness of wilderness. One may conclude that a changing attitude towards nature and wilderness is needed. Aldo Leopold, some 25 years ago, said we must develop an ecological conscience. I offer a final quote from *Reflections,* "We know that we cannot forsake our technology, but must find a balance between it and the environment. This is the challenge of the new American frontier."

ROSAMOND P. ENGLE

*One of the country's leading ecologists and interpreters of wilderness is Sigurd F. Olson. He was born in the Quetico region near Lake Superior and knows the rivers, lakes and forests well. He has served as president of the National Parks Association and of the Wilderness Society and has also served as an adviser to the Isaac Walton League of America. He should not be confused with the photographer, Sigurd Olsen, whose excellent work has appeared in the *Bulletin.*

The following is an abbreviated list of suggestions for Christmas giving. It is arranged by title with author in parentheses; publisher precedes price; (P) = paperback. Foundation members receive a 10% discount on all books purchased through the book committee. For further information, call Mrs. Harry Slater, 232-0456.

ENCYCLOPEDIAS:

Gardening Encyclopedia Revised (Wyman). Macmillan, $19.95.

Hortus Third (Bailey). Macmillan. $99.50.

HOUSE PLANTS:

The After-Dinner Gardening Book (Langer). Macmillan, (P) $1.95.

The A-Z of House Plants (Crown Staff). Crown, $10.00.

Plants that Really Bloom Indoors (Elbert). Simon & Schuster, (P) $3.95.

Your First Orchids and How to Grow Them. Oregon Orchid Society Inc., (P) $2.95.

IDENTIFICATION:

The Color Dictionary of Flowers and Plants. Crown-Royal Horticultural Society, (P) $6.95.

Complete Guide to Plants and Flowers. Simon & Schuster, (P) $6.95.

Fern Growers Manual (Hoshizaki). Knopf, $15.95.

Flora of the Pacific Northwest (Hitchcock). University Press, $25.00.

A Guide to Field Identification of Trees of North America. Golden Press, (P) $4.95.

The International Book of Trees (Johnson). Simon & Schuster, $29.95.

Ornamental Conifers (Harrison). Hafner-Macmillan, $17.95.

Plants and Animals of the Pacific Northwest (Kozloff). University Press, $14.95.

The Shrub Identification Book (Symonds). Morrow, (P) $5.95.

The Tree Identification Book (Symonds). Morrow, (P) $5.95.

RHODODENDRONS:

Azaleas (Galle). Oxmoor House, $6.95.

Dwarf Rhododendrons (Cox). Macmillan, $9.95.

Rhododendrons and Azaleas (Bowers). Macmillan, $15.95.

Rhododendrons of the World (Leach). Scribners $42.50.

Rhododendrons in America (Van Veen). Sweeney, Krist & Dimm, Inc. $25.00.

VEGETABLES:

Better Vegetable Gardening the Chinese Way (Chan & Gill). Graphic Art Center, (P) $4.95.

Book of Vegetable Gardening (Faust). New York Times, (P) $5.95.

WILDFLOWERS:

Mountain Wildflowers in Color (Huxley). Macmillan, $5.95.

Peterson's Field Guide — Pacific States Wildflowers (Niehaus). Houghton-Mifflin, $10.95.

Six Wildflower Guides: *Forest and Woodland, Field and Slope, Marsh and Waterway, Seacoast, Arid Flatlands, Mountains* (Clark). Gray, (P) $3.95 each.

Wildflowers of the Pacific Northwest (Clark). Gray, $45.00.

Garden Vignettes

We have a new selection of vignettes for you and a suggestion for the next issue, which will appear in early spring:

Sometime in May, *Cornus florida* var. *rubra* bursts into vivid bloom just before its leaves appear. Gardeners have struggled to find companions for this lovely plant whose delicious bright pink bracts slowly fade to a softer tone. Besides its somewhat difficult-to-match color, the tree presents other problems. Mature specimens cast very heavy shade; their branches sweep low to protect the tender bark from sunscald. It often has a dense, shallow root structure.

For those of us who are fortunate enough to live in the Pacific Northwest, *Cornus florida rubra* presents one of a sucession of flowering climaxes. What do you plant with it? The editors of the *Bulletin* and the many gardeners who have saved a special spot for it would be interested in your suggestions.

Let us hear from you! *J.P-B.*

There are a few corners of my garden where the plants growing together truly delight me, especially at certain seasons of the year. I can say to myself with relief, "Good, at least these don't need to be moved to better spots."

One of these corners is particularly pleasing in late April. The mundane but lovely *Rhododendron* 'Unique' sets the color theme with its copper-peach-fading-to-cream blooms. Arching above is a Japanese maple and below is the low-growing form of *Stranvaesia davidiana* var. *undulata*. Their coppery leaves unfold at the same time. Adjacent is *Pieris japonica,* its new leaves greening, but still tinged with copper. The yellow flowers of the ground dressing *Waldsteinia fragarioides* add a bright touch. Overtopping the group is a tall, branching Himalayan pine, *Pinus wallichiana (P. griffithii)*, a particularly graceful and delicate pine for a small-scaled garden.

Of course, no spot is completely satisfactory in my garden, so I have plans to move in several dwarf rhododendrons 'Blue Bird' which are crowding smaller plants in another part of the garden. They will give a bright blue contrast to the monochrome coppers.

Meanwhile I am waiting for the "newspaper method" of killing grass to work in the area under the *Pinus wallichiana,* grass which I have never been able to weed out completely. By this method newspapers are laid over a pesky grassy area, then covered with a thick layer (three to four inches) of chips mixed with dirt. It has taken a year, but the grass is gone, the newspapers almost rotted and the sacrificed ground cover, *Waldsteinia fragarioides,* is creeping in again.

I just wish my garden had much more satisfying areas with plants that didn't need moving!

ELIZABETH MOSES

Early in September, as the morning sun touches the top of our large freestanding firethorn, I see three house finches feeding on the bronze-gold berries which won't be ripe for several more weeks. In a moment, the three birds fly to the birdbath at the edge of the vegetable garden, joined by a fourth for a communal bath.

This *Pyracantha,* which is probably *P. coccinea* var. *lalandei,* is about 12 feet high and about 15 feet across. It stands in the southwest corner of the yard by the fence between our property and the next door neighbor's. I understand it died to the ground in the November, 1955 freeze, but now provides a splendid screen the year round. In June it is covered with white flowers, which have a somewhat obnoxious odor, but which are loved by the bees. Now in the fall, it is coming into the peak of its splendor and interest for us, and for the birds. In another two or three weeks it will still be loaded with bright orange berries and visited by flocks of the larger and more aggressive robins and starlings along with several flickers passing through on their way south.

Because of its location on the property across the alley and just south of us, a magnificent old native dogwood tree *(Cornus nuttallii),* 45 to 50 feet tall, seems to be an extension of our garden.

Now in the fall, it is putting out its second crop of blossoms with the leaves just beginning to show a hint of various reds and yellows. This tree is a joy all the year, with a lovely branching pattern which I enjoy against the gray winter sky when all the leaves have finally fallen. It is tall enough, too, that it provides some shade for our yard from the summer sun in early afternoon. In fact, I think we get more enjoyment from it than the people in whose yard it grows.

Off to the right of the pyracantha, about midway along the west fence, is a *Stewartia pseudocamellia* which is now about 10 feet tall. This was purchased as a five-foot tree at one of the Arboretum Plant Sales about eight years ago, and of all the things I have bought over the years, it is my favorite. Until about two years ago it was very columnar in habit, but now the branches are beginning to reach out horizontally. So far it hasn't bloomed, but if it never did, I would keep it for the fall foliage alone, which stands out against a background of dark, evergreen trees across the way. By about mid-October, it is a brilliant orange-red, and there is no exaggeration in calling it flame-colored. Of course if there is morning or afternoon sun, it is especially brilliant, but even in dark, rainy weather it has a warm, bright glow which we thoroughly enjoy. The bright leaves stay on the tree for quite some time before turning a little darker red and finally falling. It has had consistent good color year after year.

The color of the firethorn berries and the two trees all blend together, seeming brighter and sharpened by the contrast with the evergreen trees and the green shades of the pieris and rhododendrons between them.

DOTTY CROPLEY (MRS. M.L.)

Blooming in summer and throughout fall, the graceful *Anemone hupehensis* var. *japonica (A. japonica)* reaches nearly four feet in height. Atop the lush green foliage and tall slender stems, the flowerstalks are arranged in an umbrella-like fashion. The soft satin-pink or white semi-double flowers dance with the slightest breeze. With the three-to-five-lobed leaves, they make an excellent show along my dark mahogany-colored fence.

This hardy, fibrous-rooted perennial may be propagated by division in the fall. The flowers, buds and leaves dry beautifully in silica gel for bouquets to brighten those dark February days.

My daughter Dorsey (age nine), also an Arboretum Foundation member, says "Anemone, Anemone, MY FAVORITE!"

DORSEY AND D.J. WYBLE

Pablo Retires – Again

The staff file-card reads in part:
Abellera, Pablo L.
Date Started — November 1, 1956
Date Terminated — 11/24/67
Retired (Part-Time) — 3/1/68
Terminated — 8/31/77

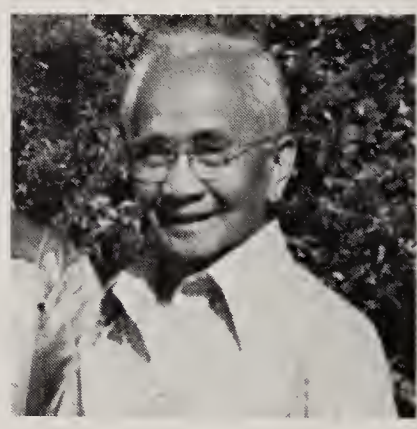

Photo: J. Henderson

These cold dates reflect nothing of the fidelity and dedication that Pablo gave to the Arboretum between November, 1956 and August, 1977. He joined our staff as a gardener and retired as a gardener but to those of us fortunate enough to work with him he was much, much more. Perhaps the epithet that would fit him best is "the indispensable one," for he would truly and willingly do a myriad of chores around the Arboretum. Especially after his first retirement when he was living on the grounds, he was watchman, caretaker, gardener, seed-collector and cleaner, and custodian. However, his greatest contribution to the Arboretum was that of our ambassador of goodwill to the world at large.

He and his charming wife, Filomina, are returning to the Philippines and they carry wishes from all of us for the best of good fortune and great happiness in their new home. Be certain that we all will miss them.

JOSEPH A. WITT

Announcements from the Unit Council

An important event this spring will be the First Unit Council Flower Show to be held at the Museum of History and Industry March 30th and 31st. Cut specimens of flowers or unusual foliage, as well as houseplants and bonsai will be displayed. All plant material entered must be labelled with the correct botanical name and must have been grown in the entrant's garden for at least three months. It is hoped each unit will enter an exhibit. This promises to be a wonderful opportunity to see the variety of plant material being grown by Unit Council members.

The Horticultural exhibit with Margaret Mulligan (Mrs. Brian) as chairman, will be given increased emphasis at Unit Council meetings. The specimens of flowering or berried plants, as well as interesting and colorful foliage, are always a popular part of each meeting. Camellias will be sold at the meeting on March 16th. In addition, a large selection of garden books is always available for sale. Units are reminded that two of their members should attend each Unit Council meeting.

Plans are already under way for the Plant Sale, May 3rd and 4th at the Arboretum. Sara Navarre (Mrs. James), Donations chairman, asks that any plants you can donate to the sale be potted and wintered in your own garden or taken to one of the following collection stations:

Kate Stewart (Mrs. C.R.) 4640 89th S.E., Mercer Island (232-6077)

Diggs Docter (Mrs. Jack) 4202 48th N.E., Seattle (523-8161)

Ruby Williams (Mrs. W.E.) 11640 S.E. 196th, Renton (854-4014)

Jeannine Bannick (Mrs. Stephen) 12904 74th Pl. N.E., Kirkland (822-2115)

Native Plant Chairman, Lois Fraser (523-3972) urges those collecting native materials this winter or spring to bring back extra plants and save them for the sale.

Food Chairman, Arlene Sourbeer (Mrs. Claude) suggests that when baking cookies for the holidays, you bake an extra dozen and freeze them for the sale or send them to her at 5603 W. Mercer Way, Mercer Island (232-3164).

Anyone wishing to help with the sale, call Barbara Andersen (Mrs. James) at 232-0752, Chairman, or Ann Rogers (Mrs. Kent) 232-2232, Assistant.

A series of three or four training sessions for Native Walk Guides will be held at the Museum of History and Industry beginning February 28th from 10 to 2. Call Sheila Taft (Mrs. David) 523-5027 or the Foundation office for more information.

RUTH MARY CLOSE

Notes and Comments

We regret to announce the retirement of Marilynn R. Holm who has so faithfully served the Arboretum Foundation as Executive Secretary since 1969. We welcome Jewell Hickey in her place, assisted by Margaret Kearns.

The interior of the Arboretum offices was repainted for the first time in many years through the generosity of the Unit Council. The new lighting and clean paint certainly make the offices much brighter.

Those who have greenhouses or might be thinking of building one may wish to become acquainted with a book on greenhouse management called *Greenhouse Grow How* by John H. Pierce, which has recently been published by Plants Alive Books of Seattle at $19.95. Its local interest extends particularly to the Unit Council since several members of Houseplant Unit 84 are pictured in it.

New Members of the Arboretum Foundation

We are pleased to welcome the following new members (June 16, 1977 through August 31, 1977):

Supporting — Carl Ferris Miller. *Contributing* – Peter M. Damm. *Sustaining* — Mr. and Mrs. Don Epstein, Vasco J. Fenili, John Peninger, Arnette Schlosser. *Annual* — Velma Balut, Mrs. Richard W. Bowden, Mrs. Darlene Bruner, Marvin Burke, Helyn M. Colman, Francis Cook, Diane Crummelt, Mrs. Teresa M. DeLorenzo, Mrs. Rebecca Durkee, Mrs. Rose Gutschmidt, Sharon Habener, Yoko M. Hiraga, Gene Hooker, Mrs. Byron N. Inman, Mrs. Victor Klee, J.F. Lienesch, Ms.

Laura Lindstrom, Wilda Luttermoser, Mrs. John C. Lyon, Alyne Richard, Mrs. O.J. Saltarelli, Mrs. R.D. Smith, Mrs. Virgil D. Walker, Joan Walz, W.A. Watts, Mr. and Mrs. Bertram Weill, Mrs. Charlotte Wheeler.

We are also grateful to the following who have increased their dues to:

Contributing — Mrs. J.H. Brownell, John W. Ormsby.
Sustaining — Ernest A. Ager, Mr. and Mrs. James B. Lewis, Oscar A. Nelson, John Osberg, Colonel and Mrs. T.A. Rathje, E.W. Stuchall, Mrs. Estelle Wertheimer, Mrs. June Willstadter.

University of Washington Classes

Spectrum, the quarterly journal for Continuing Education, is sent free to those who have indicated interest in the University of Washington's night courses, adult education classes, concerts and other cultural activities. Those who wish to obtain early notice of such classes and registration forms are urged to place their names on the mailing list by calling 543-2590.

Continuing Education

ALPINE PLANT LIFE. This lecture series is offered again by Ola Edwards for native plant enthusiasts. Wednesday nights, January 11-March 1; 7:30-9:30. Eight sessions including a Saturday field trip, $30.
LANDSCAPE DESIGN. Instructors: Patricia Gutter, Assistant Professor, Landscape Architecture, and David Lofgren, M.S., Ornamental Horticulture. Thursday nights, January 12-March 16; 7:30-9:30. 10 sessions, including two Saturday half-day field trips, $40.
CHINESE LANDSCAPE PAINTING, a studio course. Instructor: Grace Chow, painter. Tuesday afternoons, January 10-March 14; 1:30-4. 10 sessions, $30.

To register, obtain a free copy of *Spectrum,* which has full information and registration forms. Call 543-2590.

Arboretum Courses

Arboretum Courses for Winter Quarter will include propagation, grafting, basic garden maintenance, pruning, bird identification and a new class in winter tree identification.

For further information, call 543-2730, or obtain a free copy of *Spectrum* by calling 543-2590.

The Edmonds Community College offers a variety of subjects in Ornamental Horticulture which may lead to a one-year certificate or a two-year degree of Associate of Technical Art. Many of the course offerings may be of interest to readers of the *Bulletin.* For further information contact: the college at 775-4444, or specifically Walt Bubelis, ext. 257 or Dennis Thompson, ext. 335.

CALENDAR OF EVENTS

Arboretum Foundation:		Regularly Scheduled:	
Board of Directors	December 1	Greenhouse Day	Every Tuesday
	March 9	The Mae Granston Rhododendron Study Group	1st Monday
Executive Committee	January 12	Herbarium Committee	1st Friday
	February 9	Northwest Natives Study Group	3rd Monday
Unit Council:		Rock Garden Study Group	3rd Wednesday
Unit Council Meeting	March 16	Special Study Group	4th Monday
Governing Board	January 5	Arboretum Explorers	4th Wednesday (Except December)
	February 2		
	March 2		

First Unit Council Flower Show: March 30 & 31
Work and Fun Day: April 13
Arboretum Foundation Plant Sale: May 3 & 4
FOR INFORMATION, CALL 325-4510

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Published by the
Arboretum Foundation
University of Washington Arboretum
Seattle, Washington 98195

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Photo: E.F. Marten

Arboretum Drive East near the cistus collection.

THE ARBORETUM IS FUN TO VISIT IN THE SNOW

But even more exciting are the flowers that bloom
in the winter garden in late January to March.

Other highlights are the early cherries, the camellias
and the witch hazel collection.

Join the Explorers' Walk, meeting every 4th Wednesday each month, except December, in the parking lot of the administration buildings at 10 a.m. January 25, February 22 and March 22.